January 1964

Agriculture

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Turkeys—Is there a breeding problem? . *D. M. Cooper and A. E. Beer*

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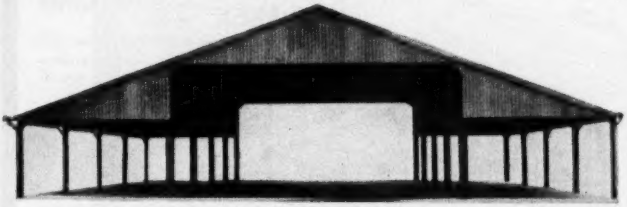

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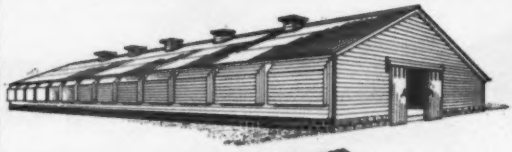

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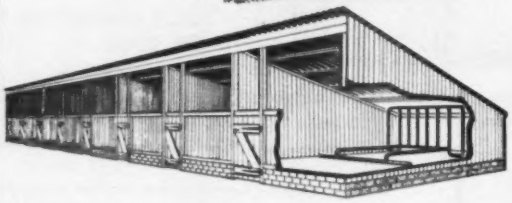

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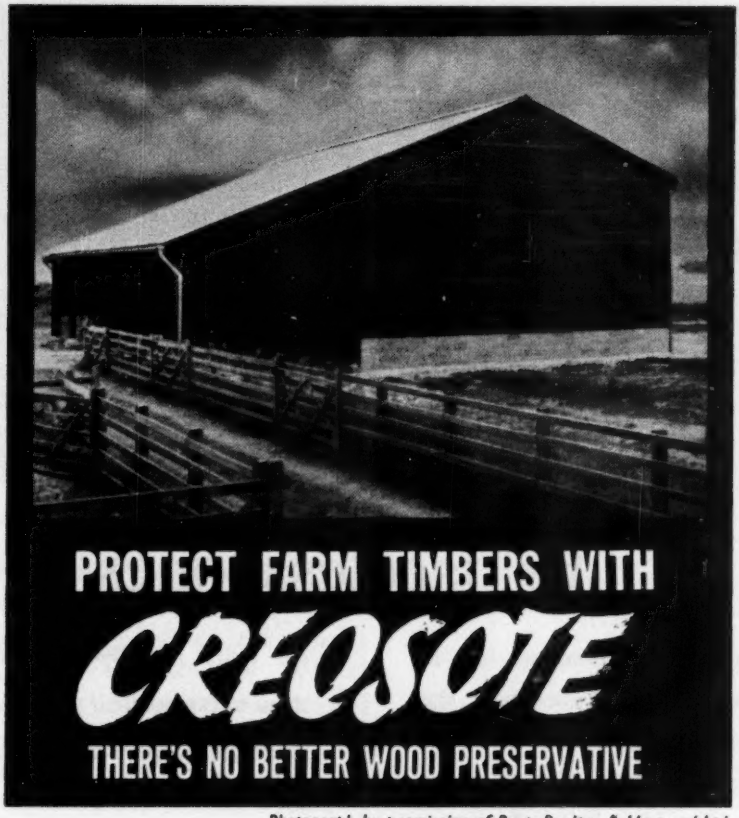

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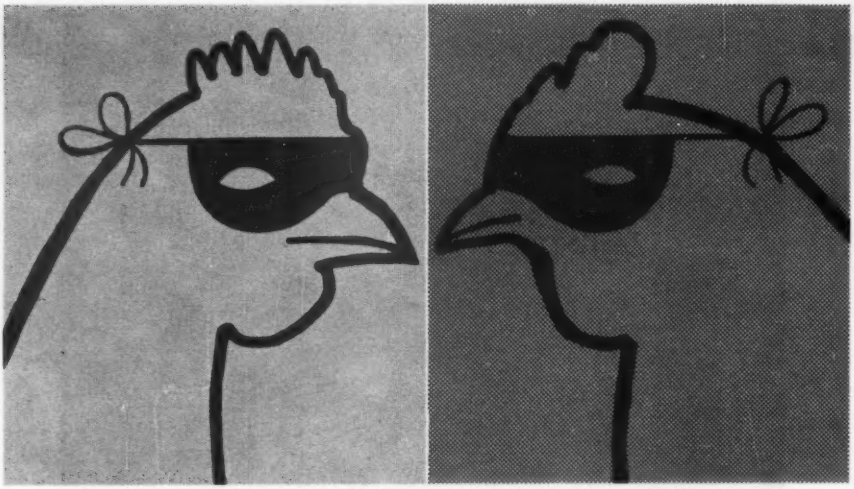

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MODERN FARMERS RELY ON ICI—AND PROFIT BY EXPERIENCE

Fowl Pest

Don't hesitate,

VACCINATE!

For nine months now the control of fowl pest has been by vaccination instead of compulsory slaughter. During this time 165 million doses of vaccine have been bought, which is a rate sufficient, if maintained, to protect some 68 per cent of our poultry. But this figure is well below what is needed.

Mainly it is the small poultry-keeper who is failing to vaccinate his birds, and it cannot be stressed too strongly that this exposes the whole industry to serious loss. A great weight of infection can build up in unvaccinated flocks.

The immunity which develops as a result of vaccination will not resist unlimited challenge, and to be effective the vaccine must be used properly. Only too often when fowl pest appears in flocks in which vaccine has been used it has been found that the vaccine has not been given a chance to do its job. It may be that the flock had only been vaccinated in part or that the full vaccination programme had not been carried out. The vaccine may have been stored at the wrong temperature or exposed to sunlight; it may have been badly injected or a full dose not given; or it may have been used on birds already incubating fowl pest or under some stress interfering with the development of immunity. Fowl pest can be introduced at the time of vaccination if staff and equipment are not adequately disinfected. The vaccine itself cannot introduce the disease; it is sterile.

Good control of fowl pest can be secured only if every poultry-keeper vaccinates his birds—and keeps on vaccinating at the recommended intervals. Only thus will he protect himself, his neighbour and the industry.

The vaccine and advice on vaccination problems are readily obtainable from the Ministry of Agriculture's Divisional Veterinary Officers.

Self-service shopping means choice and convenience and so tends to increase consumption

The Distributor's Viewpoint

W. G. McCLELLAND ★ R. NICHOLSON

PEOPLE talk of the 'retail revolution'. How does it affect the farmer and grower? How are they to ensure that tomorrow and the day after tomorrow their produce is to find a favourable market, in conditions which may be quite different from those of today?

The cardinal feature is the growth of the supermarket. Supermarkets have been doubling in number every two years or so. In the United States they now account for over two-thirds of the retail food trade, and there is no reason to suppose that they will not reach this level here too, though it may take another fifteen years or so to get there.

Supermarkets are not just self-service shops. They are *large* self-service shops selling a complete range of foodstuffs—except possibly wet fish. For the British farmer, the feature of most interest is that they sell fresh fruit and vegetables and fresh meat.

Heritage of the grocer

Most supermarkets are operated by companies that formerly ran chains of grocery shops. Our own company, serving Tyneside and the near neighbourhood, is one of these. At the start of 1958 we had no supermarkets, and almost no experience in the greengrocery and butchery trades. We were just grocers.

There are several consequences of most supermarket operators having this exclusively grocery background. First, they have had to learn new trades by engaging qualified butchers and experienced greengrocers to work for them, and they have made many mistakes in the process. Even now, they don't do as good a job as they should in these departments. Most British supermarkets —there are notable exceptions—sell little more than half the fresh meat, and half the fresh fruit and vegetables, that would correspond to their grocery sales. In the United States there is not this discrepancy, and sooner or later we shall do better here.

Secondly, former grocers are accustomed to pushing processing and packaging back up the line, away from the customer. Self-service is much easier if the goods are packaged in advance. Packaging fruit and vegetables in the retail shop is a messy and costly operation. So you can expect pressure for pre-packs. If the job is not done on or near the farm, it will be done in central packing stations operated by the supermarket chains. There are some fruits and vegetables for which in-store packaging is necessary, but not many.

Thirdly, they are accustomed to buying by telephone, on sample, and to precise specifications. They are impatient with suppliers who take the short view and the quick profit at their expense and they are impatient with the clutter and confusion and congestion of the wholesale markets. They will press for more reliable and finer grading and for long-term contracts with individual large growers or associations of growers, which will enable them to arrange economical large-scale transport of loads direct to their own stores or central premises.

Benefit to farmers

This may make it sound as if farmers will be up against a lot of awkward customers who may beat the price down and generally make things difficult for them. I think it is true that there will be some keen bargaining for large quantities, and it is certainly true that there will have to be some changes in procedures and even more in habits of mind. But I think in the long run farmers stand to get a better and fairer deal with food distribution's 'new look' than they do under the present dispensation.

One reason for this is that supermarkets can distribute produce at lower costs than the traditional forms of food retailing. For example, we can retail meat at a cost in wages in the shop only about half the average wages cost of multiple butchery shops of the traditional type. This means that the price spread between grower and consumer will be less—a particularly important point at a time of glut. When supply exceeds demand, falls in farm gate prices are often insufficient to move the surplus produce, because the high distributive margins result in the corresponding drop in retail price being proportionately very much less.

Another point is that supermarkets are more inclined to buy home-produced meat, since it keeps its bloom better than imported frozen meat, and after all the meat in a supermarket's display case must not only *be* fresh, it must *look* fresh.

Thirdly, the flexible pricing that supermarkets practise, coupled with the self-service method, means that there is not the same difficulty about selling the less popular cuts of meat. People who would hesitate to ask for a cheap cut in a traditional butcher's shop can look over the display and select the value they want. In general, the advantages to the customer of self-service shopping, in terms of choice and convenience, as well as of price, tend to increase consumption. And this is good for farmers as well as retailers.

Finally, it should not be supposed that farmers will face a single unscrupulous buyer. Retailing will always remain a highly competitive trade, and if one large supermarket group does not offer fair market prices and satisfactory trading arrangements, there will always be regional chains of quite large size competing for the output of the farmer who grows or rears quality.

Advantage of large shops

The advantages of scale in the retail establishment should not be overlooked. Supermarkets are large not just because they combine the grocery, greengrocery, butchery and bakery trades, but also because, even within any one of those trades, the sales volume of many of them is several times greater than that of any but the largest of the traditional type of shop. What does this mean?

For one thing, it means a quicker turnover of stock. It becomes economical to deliver the most highly perishable products daily or even twice a day, and others several times a week. This in turn means not only fresher goods on sale but that it is more economical to install whatever refrigeration or other special stockholding facilities may be desirable.

Apart from that, high volume makes fine sub-grading possible. Particularly in fruit and vegetables, the weeding out of slightly sub-standard produce, to be offered for sale at a lower price on a separate part of the display, is worth while. A further point about high volume, and one which supermarket operators have as yet by no means fully exploited, is that it is worth carrying some of the less popular products, such as aubergines and artichokes, which would not be carried in a shop with smaller volume in the same kind of neighbourhood.

The need to get together

Farmers, then, would do well to watch these developments closely, to see how they can fit in with them, and to provide help and stimulus for them where they can. Supermarket operators are anxious to learn. Grocers have a long tradition of trade education. They find that in the butchery trade there is a well-established system of apprenticeship and examinations, and not a great deal of extra knowledge is demanded by self-service—though there are, of course, techniques of wrapping and display, various sorts of transparent film, and so on.

The greengrocery and fruit trades, however, seem to be less well developed in this regard. There are no widespread arrangements for imparting knowledge about the handling and shelf-life of different items, what conditions of temperature and ventilation they need, what are the marks of quality and the typical characteristics of different varieties, what are the seasonal and regional patterns of price and supply, and the rest. Supermarket companies are starting very much from scratch in the design of vehicles and display

fittings, in developing rules for shelf-life and re-ordering, and in training themselves and their staff generally. Growers could help them considerably—and perhaps help them to understand the growers' point of view—by encouraging visits to their farms and market gardens, their orchards and glasshouses and packing stations.

In turn, may we suggest visits to one or more of the supermarkets? There is little about the handling of meat that Sainsbury's, for example, do not know, and of their supermarkets the relatively recent one at Cowley, Oxford, is impressive in most respects. In fruit and vegetables, the new Safeway store at Bedford is interesting since customers are encouraged to select and bag the articles themselves, weighing if they wish, the final weighing being done at the check-outs. The Gardners supermarkets in and near London, which belong to the same organization, may however be found more accessible. Those who can get to the north-east, we should of course always be glad to welcome at Laws. If none of these suggestions is convenient, it may be worth mentioning that *Self-Service and Supermarket*, the trade periodical, publishes an annual Directory of all supermarkets in the country, giving addresses, and in most cases size and range of stock; or the Supermarket Association will advise you.

The job of providing what goes on the dining-room table is after all one continuous process, from the time that the lamb is born, or the seed is put into the ground—or even earlier—to the selection of the joint or cauliflower in the shop and its cooking and serving. We retailers try to keep in touch with the housewife, and in a time of rapid change in methods, organization and scale of operation, it is equally important that producers and distributors should be in touch with each other.

Mr. W. G. McClelland, M.A., is Managing Director and **Mr. R. Nicholson** is Perishables Manager, of Laws Stores, Ltd., of Gateshead, Co. Durham. Mr. McClelland took his degree at Oxford and joined Laws (the family business) in 1948. He has since returned to Oxford, where he is now Research Fellow in Management Studies at Balliol College. He is also a member of the Consumer Council. Mr. Nicholson has been with Laws since 1954, after previous experience in banking and insurance. He was Central Warehouse Manager until he became Perishables Manager in 1962.

Seventh British Weed Control Conference

This Conference, organized by the British Weed Control Council, will be held at the Hotel Metropole, Brighton, on 23rd–26th November, 1964.

Copies of the First Circular, giving full details, can be obtained from the Conference Secretary, W. F. P. Bishop, 140 Bensham Lane, Thornton Heath, Surrey.

Geoffrey Forrest

recommends that more farm buildings should be

Built of Wood

(especially home-grown)

IN a good many parts of England and Wales it is not so long ago that most of our farm buildings were, by tradition, built wholly or mainly of timber —and home-grown timber at that. Many of these, some of which must be 150–200 years old, are still in use and testify not only to the quality of the timber used but to the wisdom of those who built in this material so many years ago.

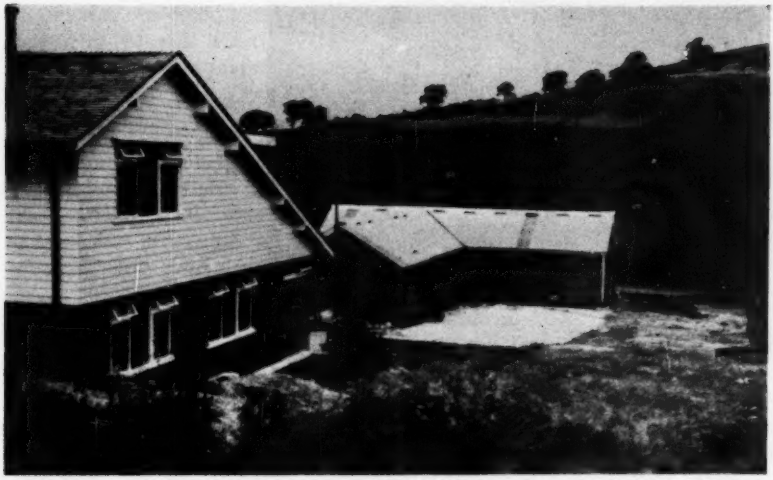
In many other countries—notably perhaps in Scandinavia, Switzerland, Austria, Canada and the United States—the tradition of making almost all buildings in timber has continued; everywhere you go in the country districts you see charming examples of well-designed, well-constructed houses, churches and farm steadings.

The case for wood

It might be true to say that the timber trade has paid too little attention to the potential market for timber in our own agricultural industry, and in consequence there has recently been a complete swing away from timber to steel, concrete and asbestos. Granted these materials have many advantages, but so has timber, as I shall point out in this article.

People have begun to think that steel, bricks and concrete, because they are harder than timber, are also more durable. But is this so? Bricks and concrete can easily be damaged by a knock from a tractor but are not so easily repaired; steel has to be kept painted or it soon rusts. When you go fully into the matter it becomes apparent that there are disadvantages as well as advantages in their use.

During the last few years several new firms have started to manufacture timber houses, offices and other buildings for industry. To judge not only from their advertisements but from the amount of work either completed or under construction, they are having a great deal of success. Timber is also being used very widely for such things as deep litter and broiler houses. All this points to a revival in the use of timber for different kinds of building in this country. I suggest there is a great deal more scope for its use on our farms today.



Home-grown timber house and farm buildings on a Forestry Commission smallholding in mid-Wales

Recently a lot of interest has been shown in the use of exterior grade resin-bonded plywood. This material, much of which is produced from Douglas Fir grown in British Columbia, has been widely used for some time in Canada where it has proved very successful. It is strong, light and has excellent insulating qualities. Now that it is readily available in this country it seems likely that its use will increase steadily.

THE ADVANTAGES OF TIMBER BUILDINGS

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Low cost of maintenance.

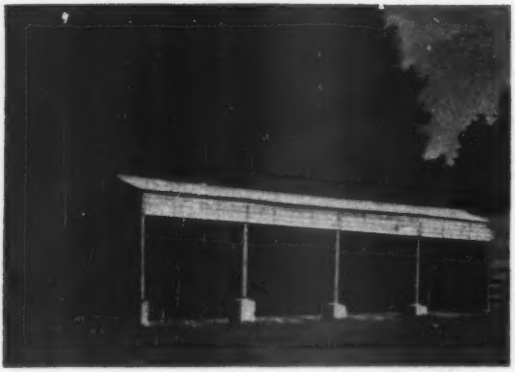
Ease of repair. Almost anyone can replace a broken cladding board or splice a new section on to a door post, but to repair brick, concrete or steel work often calls for a craftsman.

Freedom from the condensation troubles that so often plague buildings with steel roof members.

Animals do not injure themselves so easily on timber as on harder materials.

Foundation loadings are lighter and better distributed, resulting in less damage from settling or subsidence.

By no means the least important is their ability to blend with their surroundings.



Well-made, sectional timber building, suitable for use as an implement shed

One subject nearly always crops up when one discusses timber construction—dry rot. It is true that a lot of damage has been caused by this fungus in recent years, but it is said that no serious outbreak has ever occurred in an all-timber building. Nevertheless it is much better to be on the safe side and one should always specify that all timber be protected by one of the several well-tried commercial preservative treatments. These give complete protection against all forms of fungal and insect attack. The additional cost of treating all the timber needed to build the average farm cottage is about £18—so low a figure that it is surprising that anyone should build without using one of them. The benefit of such protective treatment is now so well recognized that the Ministry of Agriculture will not sanction grants for wooden buildings unless the timber has been treated by one of the approved methods.

On holdings in Wales, for example

In Wales the Forestry Commission owns a large number of small farms, most of which are occupied by its own workers. These little holdings are the remains of larger farms where the hill grazing has been afforested, leaving a small area of bottom land with a farmhouse and buildings.

Unfortunately most of them were in bad order when they were acquired and the Commission has been faced with the very difficult problem of replacing the existing old and often semi-derelict range of buildings with something modern, adaptable and easily constructed. They had to be adaptable to allow for possible future amalgamations, and they had to be easily constructed because many of these holdings are in very remote situations where tradesmen do not like to spend any longer time than necessary. Something which could be partly prefabricated and quickly built up on site was clearly indicated. It was also necessary to have a design which would be susceptible of several different layouts because of the severely limited amount of level ground available on these small mountain farms.

A number of these farms are in traditionally milk-producing areas but most are livestock rearing places. It was important to have one standard plan so it was decided that the design must be sectional and, since the buildings on some farms would have to comply with the dairy regulations, that the size of the standard section should be that of a two-cow standing.

In this way one could have stalls for 2, 4, 6 or more dairy cows, while equally one could provide a series of boxes of different sizes suitable for use on the livestock rearing type of farm.

Standard design

With the ready help of the Farm Buildings Advisory Officer on the staff of the Regional Land Commissioner for Wales, a set of standard designs was worked out. Because the holdings are small and we wanted to keep the cost of the permanent equipment as low as possible without sacrificing efficiency and good design, it was decided to do without feeding passages in the cowhouses. The resulting section measures 14 ft × 13 ft, and the building is made up of any required number of them.

Home-grown timber, of which the Forestry Commission is a very large producer, best fitted all these requirements. Many people, still thinking in terms of war-time scarcities, believe that trees grown in this country are in some way inferior to those grown abroad. This is a misconception. What has been unsatisfactory, and indeed is still often unsatisfactory, is the system of grading of home-grown timber—or perhaps the lack of a system of grading! This problem is, however, being overcome, and as more and more timber from our home forests comes on to the market there should be no difficulty in securing good quality stuff suitable for almost all purposes. Even at this moment, provided the timber is properly selected, it is entirely satisfactory for constructional work.

A point to remember in all cases of timber construction is that if particularly large timbers are used the cost of the building will quickly go up. We kept this carefully in mind in the design of these farm buildings. The exterior skin consists of 4 in. × 1 in. cladding, and most of the framing is 4 in. × 2 in. The Portal frames, where the largest sizes are used, consist of two 6 in. × 2½ in. timbers bolted together.

Many contractors will no doubt prefer to use imported timber because it is at present not always easy to obtain home-grown material in the right grades. But it may be of interest to people anxious to promote the use of home-grown timber to quote the specification used by the Forestry Commission for its own buildings.

FORESTRY COMM. SPECIFICATION

GENERAL	All timber to be home-grown and to comply with specifications B.S.S. 1860 and C.P. 112.
TIMBERS	(a) Internal and external load-bearing wall frames and exterior cladding to be Scots Pine, European or Japanese Larch or Douglas Fir. (b) Internal woodwork to be for preference any timber specified for load-bearing wall frames, otherwise to be Sitka or Norway Spruce.
RATE OF GROWTH	Fast-grown timber is not to be used. Four growth rings per inch will be acceptable as minimum.
MOISTURE CONTENT	Shall be within the following limits: (a) All internal doors and other internal joinery 20%. (b) All external doors and other external joinery 23%.
METHOD AND TYPE OF PRESERVATIVE	The preservative treatment to be used shall be that specified by an approved commercial process and the treatment must be carried out exactly in accordance with the manufacturer's instructions.

Geoffrey Forrest, F.L.A.S., is Conservator and Chief Land Agent to the Forestry Commission in Wales.

Less frequent cleaning out means a saving in the labour bill. U.S.A. practice reports favourably, but British poultry farmers are advised to go cautiously

Indoor Lagoons for Poultry

Clive Tetlaw

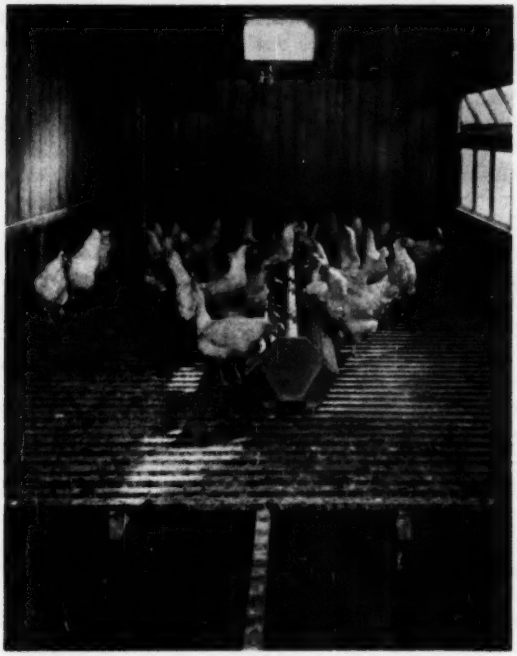
THAT a laying hen produces both eggs and manure is a source of pleasure to some poultry farmers; but not to others. To some, poultry manure is a valuable means of reducing fertilizer bills, but to others it is something to be got rid of as cheaply as possible.

It is to this latter group of farmers that indoor lagoons for poultry have a definite appeal. The alternative to removing manure from the poultry house is to leave it in the house and have a lagoon. It must be said at once, however, that the system is still very much in the experimental stage and as such an element of uncertainty still remains as to its success.

An indoor lagoon for poultry is a pool of water which lies under the slatted or wire floor of the poultry house and over which the birds are housed. This idea is not new. It has been used in laying battery cage units where channels run under the stacks of cages. The droppings fall into these channels and are removed from them as slurry. What *is* new, is the length of time the slurry remains in the house before removal. In the former method it was removed at intervals of up to a month; with a lagoon the aim is to avoid removal for at least a year and preferably for several years. This has been achieved for a period of two years in the U.S.A. and for a period of one year in the United Kingdom.

Happy poultryman

The breakdown of droppings is brought about by bacterial action, both aerobic (requiring oxygen) and anaerobic (not requiring oxygen). The more successful are the bacteria, the happier is the poultryman! The degree of decomposition is shown by the fact that in one lagoon, after two years in use,



Hybrid pullets on slats over a lagoon at one of Silcock's experimental farms in Cheshire

there was only 14 per cent solids in 16 inches of water. It has been estimated that there is an accumulation of solids of one inch every year. This can be compared with about a depth of 3 feet of droppings had they been allowed to accumulate in solid form.

Methane and carbon dioxide are given off as a result of bacterial action, but with good ventilation these gases are harmless to the birds. A sewage-type odour has also been reported, but this was said to be no stronger than ammonia fumes from solid manure. Attempts have been made to speed up bacterial action by agitating the slurry, adding oxygen or providing heat, but the value of these measures is still doubtful. It may be that in the future, control can be obtained by adopting these measures and, looking further ahead, by adding certain cultures or controlling the pH level.

The foundations of the poultry house are in the form of a watertight pit, to prevent any seepage from the lagoon. Waterproofing is by lining with 6–8 mm. polyethylene or by using waterproof concrete. The pit must allow for about 2 feet depth of water, which, with a stocking rate of 1½ sq. feet a bird, gives 3 cu. feet of water per bird. This is the quantity frequently recommended. The level of water is kept constant by means of a float valve and making provision for an overflow. The floor can be sloped for easy cleaning out. One house that comes to mind is 48 ft × 160 ft, is 2½ ft deep at the ends and slopes to 3½ ft at the centre, with a slope of 3 inches to one side.

What are the advantages?

The removal of manure and litter from poultry houses at the end of the laying cycle and between batches of birds is a laborious and costly job—

often as much as £50 for 1,000 birds. It also creates a labour peak above the routine jobs which is particularly difficult to deal with on large specialist poultry farms, and this is particularly so where the poultry programme is planned around a policy of periodic depopulation.

Clearly then, every poultry house will show a saving in labour cost from less frequent cleaning out and this is the one advantage to which a definite financial saving can be put for all poultry houses. The advantages referred to below relate to claims made for individual lagoons, and may not, therefore, have a general application.

A better hen-housed average has been reported from birds housed over a lagoon compared with birds on litter, and this despite a higher mortality (about 4 per cent) in the lagoon-housed birds. In another case, where poultry were housed at 2 sq. ft per bird, a slatted floor house incorporating a lagoon gave 4 per cent better egg production than birds housed on litter; and the pounds feed per dozen eggs was 4·52, compared with 4·66 on litter. This better rate of feed conversion may be partially due to the warmer and more constant house temperature with the lagoons.

These results refer to poultry lagoons in the U.S.A., but similar results have been obtained in the United Kingdom. The following information is from the results of one trial which have been published recently.

Birds housed over a lagoon gave about 2 per cent better egg production than those housed over a dry pit, 5·35 lb food per dozen eggs as compared with 5·63, and a 4*s*. greater margin between income from eggs and feed cost. Another advantage is that the system also solves the fly problem in raised floor houses.

Early days yet

With these advantages, can indoor lagoons for poultry be recommended? Like all comparatively new techniques yet to be tried over a period of years, there are risks and there is no guarantee of success. There is the possibility that the droppings will not decompose, the possibility of odours arising which will taint the eggs, and the possibility of increased incidence of disease. So poultry farmers must weigh the advantages against the risks. However, where a farmer already has, or intends to have, equipment for handling manure as slurry, a sluice can be built into the pit which can be opened should it be necessary to empty the lagoon. It can then be operated as with any other system of slurry disposal, giving a built-in safety valve for the cautious minded.

During the six years **Clive Tetlaw** has been in the N.A.A.S., he has spent two years on work study. Before that he was in Greece for a year working on poultry improvement.

Eric Clifton

looks at three-years' work at Drayton E.H.F. and puts the case for the

Winter Housing of Ewes

THE weather at the beginning of 1963 made many farmers realize that there was something to be said for housing ewes during the bad weather. Some were surprised that it could be done at all, while others claimed it as a new technique. It certainly saved many ewes and lambs.

For generations it has been the practice in parts of the northern Pennines to house hill ewe hoggs from November to April, and in many lowland counties sheep houses for in-wintering or for the care of show sheep are still in use. It is also common practice in parts of the Continent where the winters are severe. There is the danger, however, that some people, without thinking critically about it, may run away with the idea that it is the right thing to in-winter all sheep regardless of breed, age, type of land or environment. The weather last winter was exceptional and it would be wrong on this account alone to adopt the practice of in-wintering sheep regardless of all other considerations.

Drayton Experimental Husbandry Farm, which has for the past three winters been studying in-wintering systems, is well in the fore-front of this work. In-lamb ewes have been wintered inside, both on slats and on straw, and compared with control groups kept on grass.

The work has shown that by wintering the ewes under cover the grassland gains by being rested, that the shepherd is working under more congenial conditions and that lambing is less hazardous than outside in hard weather. With dense stocking inside (9–10 sq. ft of floor space per ewe) there is, of course, the possibility of mismothering at lambing, but this is not a great problem. A relatively small group, no more than 30 ewes in each, helps in this respect. Cheap straw will provide adequate bedding; for a 15-week period about ¾–1 cwt per ewe will be used. When straw is dear or scarce it is possibly more economical to spend just over £1 per ewe on providing

wooden slats, which will last for a number of years. If an extended use can be found for the slats during the rest of the year, for example, rearing calves in summer, or as an in-barn hay drier, then slats may be quite an attractive proposition.

Open, airy conditions are essential, and on most farms Dutch barns can provide ideal accommodation, although draughts at ground level must be avoided. Straw bales round the pens, some six feet high, will give all the shelter required.

Experience at Drayton

At Drayton, hay, which is fed *ad lib.* in racks, is the chief food, although limited amounts of concentrates are also fed prior to lambing. In-wintered half-bred ewes will eat approximately 4 lb of hay per head per day, so for a 90-day period from mid-December to mid-March, 3 cwt of hay and ½ cwt of concentrates will be needed. Ewes outside during the same period will have some grazing and require less hay (2½ cwt) but an equal amount of concentrates. When grazing the ewes will poach the pastures, particularly on heavy land, but it is extremely difficult to measure this damage.

Ewes kept indoors gain less weight (about 8 lb) in the winter than those out of doors (about 16 lb) and also produce lambs which are, at birth, 1–2 lb lighter. This difference in birth weight does not affect growth during the following summer, and to date little or no difference has been noted in liveweight gain per day in later life.

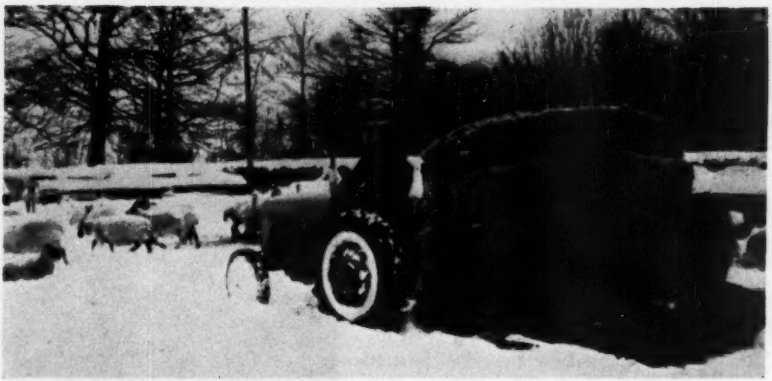
It has been suggested that troubles such as twin lamb disease may arise among ewes kept indoors without exercise, but no detrimental effect has been noted at Drayton Experimental Husbandry Farm. Only 1·4 per cent of the in-wintered sheep have been lost between tupping and six weeks after lambing. Lambing percentages, both inside and out, have been very similar. In both cases there was a good fall of lambs.

This Drayton work does show that if the weather is very hard it would be sound practice to bring the ewes under existing cover, but that it would not be economical to erect buildings solely for housing ewes in winter, as this would raise the capital requirement per head out of all proportion.

In a normal winter, on a heavy land farm, ewes can be housed to advantage, but if the farm is of a light, free-draining type the sheep will thrive just as well out of doors without damage to pastures provided the sward has a good bottom and that the wintering is not done on very young leys. There may be little difference between the cost of wintering inside and out, but in-wintering should not be made an excuse for increasing sheep numbers. The ewes have to be grazed in summer and hay has to be conserved for winter feeding.

Commercial farms agree

This has been the experience at the Drayton Experimental Husbandry Farm, but it is fair to say that on commercial sheep farms the experiences have been very similar to those quoted above. Little or no trouble has been encountered with in-wintered sheep, there has been virtually no disease problem, and on light land farms grassland has not been poached during the winter months. There has been little or no variation in the quantities of food consumed, although it is true to say that the smaller ewes have eaten slightly less than big Scotch half-breds.



A typical on-the-farm scene last winter, which suggests that there is something to be said for housing ewes during the bad weather

Lowland ewes are perhaps a different proposition from hill ewe hoggs. Weather conditions in the hills are nearly always bad and it is desirable to get growth in the sheep in the winter—although excessive fatness should be guarded against. Wintering for ewe hoggs is becoming more difficult to find on lowland farms, and far more expensive. So some form of in-wintering can help.

Again, provision of an elaborate hogg house should be looked at very carefully before it is installed, as ewe hoggs running on grass with adequate hay feeding can make satisfactory progress at home. Although a hogg house will give added shelter, it could prove to be an expensive luxury. Total in-wintering of ewe hoggs might be considered and the results will be satisfactory, but here again economics are the limiting factor. Concentrate feeding inside can push up costs as high as away wintering.

In the future

What, then, could be the trends with this system? There is little doubt that in future winters more ewes will be in-wintered, no matter what the weather may be. We may even see the adoption of Continental systems of in-wintering and clipping sheep twice a year for an increase in the wool clip. The wool may lose some quality but the greater weight may make it worth while.

Shall we also see the intensive fattening of lambs on cereal foods in buildings? An eight weeks' suckling period and four weeks' trough feeding could produce a level supply of fat lambs of a uniform quality throughout the year, particularly as out-of-season lambing becomes easier to achieve.

Any new practice which can economically help to improve the efficiency of a farm business is worth thinking about.

Eric G. Clifton, N.D.A., is County Livestock Husbandry Officer for Shropshire in the National Agricultural Advisory Service. Before going to Shropshire he served in Northumberland, Cumberland and Westmorland.

HELEN COLE
of the University of Exeter

discusses the

Economics of

Anemones in the South West

THINK of anemones, and south-west England immediately springs to mind. All three counties, Cornwall, Devon and Somerset, are concerned commercially with their outdoor production—to the extent of about 1,300 acres. Two-thirds of this area is in Cornwall, mainly westwards of a line from Truro to Newquay. There is also a fair acreage on both sides of the Tamar Valley and in South Devon around Kingsbridge, Dawlish and Starcross. In addition, there are small acreages in Combe Martin, Braunton and Barnstaple in North Devon and in the Cheddar area of Somerset. The bulk of the acreage is made up of small areas, from ¼ acre up to 3 or 4 acres.

Forty years old

It is thought that the crop's introduction into West Cornwall about forty years ago was inspired by the imports of anemone flowers from the South of France in the 1920s. Very soon afterwards anemones from South Devon and from the Cheddar area were being marketed in Covent Garden. The economic depression of 1929 brought a temporary check to the expansion of the trade, but this was quickly reversed after an import duty of 9*d.* per lb was introduced in 1932. By 1939 a total of 500–600 acres was being grown in the three south-western counties. The real, and rapid, expansion came in the late 1940s, at a time when market gardening was enjoying a seller's market for nearly all its produce. Then, hardly a dairy farm in West Cornwall was without its anemones.

The normal climate of Cornwall, with its cool, moist summers and relatively mild winters, is particularly favourable to anemones. Summer drought and

severe frosts are, therefore, hazards that can and have resulted in considerable financial losses to growers during the past decade. Gales are another hazard, especially in West Cornwall, where their severity and the absence of natural shelter makes artificial windbreaks a necessity on many holdings.

The anemone crop fits conveniently into the traditional rotations in West Cornwall. It can follow early potatoes, spring cabbage or broccoli, though it is often grown after a ley. It also plays an important part in the economy of the holding by providing remunerative employment in the autumn and early winter months for regular labour, needed throughout the rest of the year.

Variable profits

As to profitability, the margin between returns and costs varies. The greater variation, in West Cornwall at least, is in returns, due to fluctuations in yields and prices. This has been brought out by a study of costs and returns for small samples of anemone crops in that area during the past four seasons.

In 1960–61, the best of those seasons, our records at Exeter showed one outstanding yield of 5,700 blooms per 1,000 corms planted; the rest ranged from 1,200 to 3,200, but eight of the fourteen crops produced only 2,000 blooms or less. The average yield for 1960–61, 2,250 blooms (or about 1,400 dozen bunches per acre) multiplied by 7*s.* 6*d.*, the average market price that season, gave a gross return per acre of £525. A deduction of £280, the relevant picking, packing and marketing costs,* and of £130 for the growing cost, left a margin per acre of £115.

From this margin, overhead costs such as machinery depreciation, hedge upkeep and share of office expenses (say £20) have still to be deducted. Even so, £95 an acre seems a good margin. But the yield has only to be reduced to 1,750 blooms per 1,000 corms, equivalent to 975 dozen bunches per acre, to bring the margin over all costs, except overheads, down to £40 per acre.

The main economy that can be made in costs is a reduction in the labour devoted to weeding the crop. Herbicides are being used more widely, but they have not yet replaced the need for hand weeding in all circumstances. For example, they are more effective in a wet summer. The main improvement must therefore come from better yields and returns. What are the factors influencing them?

Apart from climate, the three main factors are planting date, corm spacing or planting density per acre, and cultural management.

Planting date

Planting can be spread over June and July. As one moves east from the Mounts Bay area behind Penzance to Truro, to the Tamar Valley and to South Devon, the available growing period shortens and slightly earlier planting is needed to produce plants in full flowering condition.

Flowering starts about six weeks after planting. It increases steadily, usually reaching its maximum during the fourth, fifth and sixth months and, if climate is favourable, may extend to the seventh before falling away fairly quickly.

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*Picking and packing costs @ 1*s.* 9*d.* per dozen bunches.
Marketing costs @ 2*s.* 3*d.* per dozen bunches, i.e., 10 per cent commission plus 1*s.* 6*d.* for carriage and box, etc.

Market prices also seem to follow a definite pattern through the season. From August to October they are usually at their lowest; for a dozen bunches they may fall to 4*s*. or less and only rise to 7*s*. or 8*s*. They are at their highest from November to January, ranging from about 8*s*. to as high as 14*s*. when quality is good and supplies are not too plentiful. After January they drop again, but rarely to the low levels of the autumn.

With early planting, peak picking tends to start in October, or even late September, when prices are low. But in normal conditions it does result in a good supply of flowers in the high price months of November and December and possibly early January. Rigorous grading in low price periods helps to ensure better prices.

In West Cornwall, apart from the advantage of a slightly longer growing season, much of the anemone acreage is planted in July, following early potato lifting. By this practice growers may be lucky and get their peak flowering period to coincide with the highest prices from November to January. Nevertheless, it is possible that those who plant from mid- to late-July may run the risk of failing to produce enough blooms to bring a good financial return before the onset of severe weather or maximum preoccupation with broccoli and daffodils.

The increasing use of herbicides also calls for planting before, rather than after, mid-July. Work at Rosewarne and Ellbridge Experimental Horticulture Stations seems to show that some herbicides retard growth and delay flowering.

Corm density per acre

Among the crop records studied in West Cornwall, the number of corms planted ranged from 60,000 to 190,000 per acre. Over two seasons a comparative analysis was made of those with under and those with over 100,000 corms per acre. In each season the lower density group produced per 1,000 corms, a higher yield, gross return and margin over the cost of corms and marketing

Picking anemones at Gulval in Cornwall.
The rows of broccoli growing between beds act as windbreaks

alone. In one season, when the same calculations were made per acre, this group also showed an advantage; in the other season when compared with the higher density group the per acre yield was slightly lower, the gross return was identical and the margin slightly higher—and this despite the fact that a bigger proportion of the area was planted after mid-July. These results suggest that when more than 100,000 corms are planted per acre the cost of additional corms is not matched by an equivalent output.

Cultural management

This really covers every aspect of growing the crop, including choice of planting date, spacing, carrying out the correct operations at the correct times and, very important, buying only good quality corms. In addition, experiments at Rosewarne have shown that careless weeding, which damages the plants, checks growth and reduces flower yields.

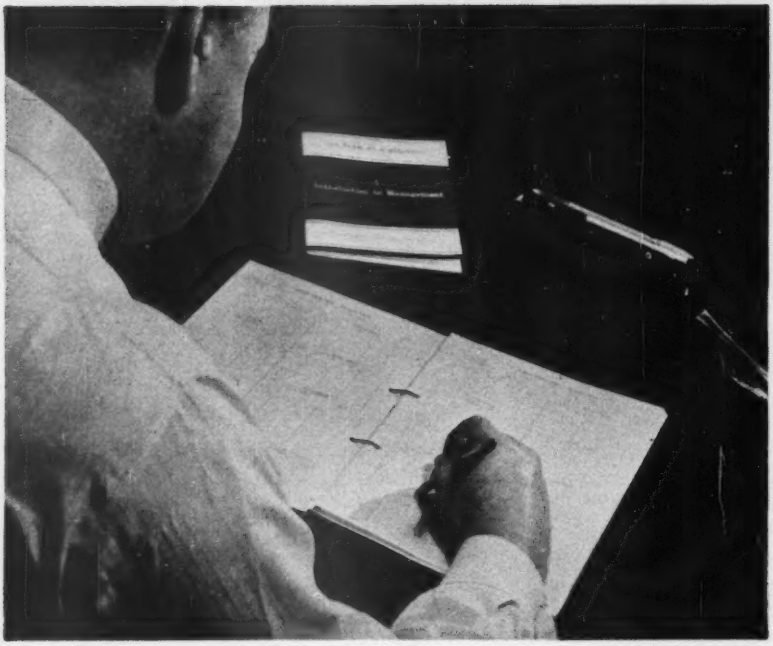
One crop record that we studied over four seasons came from a holding that consistently produced the largest number of blooms per 1,000 corms and per acre. The apparent explanation is a combination of favourable factors; late June and early July planting, low corm density, much careful hand weeding each season with no herbicides, keeping up with the crop during the picking season and care in bunching and packing. Admittedly the area of this crop was rather less than an acre. Grown on a much larger scale, it would probably not be feasible to devote so much labour to weeding or possibly to picking and packing the higher flower yield. Financial success lies in striking a balance between alternatives to find what is most suitable in given circumstances; between, for example, heavy expenditure to obtain a potentially high output and less costly methods that may lower it.

French imports

In considering market prospects, the rather heavy imports of French anemone flowers must be mentioned. Because of more favourable climate, their quality is better than almost anything grown in the south west. These imports have steadily increased over the last ten years, only slightly deterred, it seems, by the tariff increases in March, 1959. Quantities in recent seasons have amounted to the yield from 200–300 acres in this country. However, the heaviest quantities come in from January to March, when loadings from the south west are slackening off.

As a result of promising work at Rosewarne, growers in the south west may be able to obtain hardier strains of corms than those supplied from Holland, also strains resistant to downy mildew, which damages many crops in Cornwall. It will, of course, be some years before they are available commercially, but their coming could mean a more profitable anemone crop. This would be of great benefit to growers, since there is no real alternative flower or other high value crop that will provide much income in the autumn. Although polyanthus and wallflowers will begin flowering in Cornwall in September and October, the bulk still comes in the spring when labour is fairly well occupied.

Helen M. Cole, B.Sc. (Econ.), is the Horticultural Management Liaison Officer, Department of Agricultural Economics, at the University of Exeter.



What, more paperwork?

Of course, you would much rather be out on the land than sitting at a desk, but it's true that a few hours spent on paperwork may be more valuable in the long run than the same time spent in the fields.

Every farmer knows he should keep records, but are you keeping the right ones? It is far better to keep a few simple records and put that information to good use than to build up a mass of detail about your business which needs a computer to interpret it. What records should you keep?

There are three basic records that will help you run your business efficiently. First, there's the record of your financial transactions in a suitable form for management purposes, e.g., an analysed cash book. Expenditure on such items as feedingstuffs, seeds and fertilizers should be set down in separate columns, as should the sales from the enterprises making up the farm business. This will help your accountant to prepare your accounts. Physical quantities, e.g., tons of feed you've bought, should also be noted.

Second, keep a record of the concentrates fed to the various classes of your livestock. It is important that you know how much food your stock is eating, for inefficient feed use is a weakness on so many farms.

Third, you need a field note-book with a separate page for each field, so that you can record for your crops details of cultivations, seed rates, fertilizer applications, spraying treatments and yields.

This information will tell you a lot about your business. You will, for example, find out what your output was from last year's potato crop, how much feed your pigs consumed, or whether your overall profit was made by your cows which masked a loss on your poultry. This is the way to get an insight into your own business.

But more than that, you will have available in your accounts, feed records and field note-book, the information needed for a full analysis of your farm business. In such an analysis you start by comparing your output, costs and profits with those of similar farms; standards for these comparisons are obtainable from your D.A.O. If your profits are low, then you try to find the reason. Perhaps your yields are low because cultivations aren't as good as they might be, or a wrong fertilizer policy may be responsible. On the other hand, your costs may be too high, e.g., you may be employing a man for whom there is insufficient work. Perhaps a change in your pattern of farming is called for, such as the expansion of cereal growing at the expense of sheep. This analysis is sure to give you several ideas how to improve your business. You can then draw up budgets to see which of your alternative plans is likely to add most to your profit. The basic data for these budgets will come from the information recorded in your three basic records.

So don't let the paperwork put you off. It can be worth money to you if you use it to analyse and plan your business.

BRIAN DAVEY

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R. W. Soden

Deputy Regional Land Commissioner, Aberystwyth, reviews

the ways and means of

FARMSTEAD DRAINAGE

Am I concerned?

Yes, if you have livestock or make silage

FOR a year or more farmers and landowners have been at the receiving end of a spate of advice on how they may solve their individual problems of preventing stream* pollution. The need for such control can be stated quite simply. It is estimated that by 1981 the population of England and Wales will increase by more than 7 million. The demand for water for domestic and industrial purposes is likely to increase at least proportionately. Much of our present water requirements is already met from rivers, and more must be found from the same source. It hardly needs saying that this water must be as pure as possible.

But how, it may be asked, can the amount of foul drainage from a comparatively small number of widely scattered farmsteads compare with the enormous quantities produced by the inhabitants of large cities and by industry? The answer lies in the vastly greater polluting strength of farm wastes compared with others. Three examples will serve to illustrate the point. The daily output of dung and urine from one pig may be equal to the faeces of two people; from one cow, 50 people; and the effluent from one ton of grass silage (17·8 per cent dry matter) has been reported to be equivalent to 12,000 gallons of domestic sewage. Farm drainage, therefore, forms a high proportion of the total potential polluting matter.

So what can be done about it?

The first possibility is a system of housing stock which will enable both dung and urine to be kept within the buildings in a solid or semi-solid form, e.g., by keeping poultry in deep litter houses and cattle in well-bedded covered yards. Open paved areas to which stock have access should be kept to the minimum. Even in cowsheds much can be achieved by covering standings and dung channels with limestone, sawdust, shavings or other

*By definition, 'stream' includes any river, watercourse or farm ditch.

absorbent material. The roofing of dungsteads and the addition of straw to slurry to absorb the liquids should also be considered. Wilting silage and roofing the silo reduce the amount of silage liquor considerably.

Discharge to public sewers

Purification of farm effluent before it reaches a stream or ditch is said to be both difficult and costly, and until further investigation reveals a simple and inexpensive method, farmers are well advised not to attempt it. Some local authorities, with their much bigger treatment plants, are in a position to accept farm drainage into the public sewer, and though few farmers are likely to be situated near enough to one to take advantage of it, those who are may find it worth while to inquire about connection. Local authorities who accept farm drainage are entitled to make a charge for the service; these charges vary considerably and in some places may prove prohibitive.

Disposal on the farm

The practical solution on most farms will be to dispose of the effluent on to the land. The following methods have all proved effective in the right circumstances and need not be unduly expensive. Financial help towards their cost may be available under the Farm Improvement Scheme, and they may qualify for relief from taxation too under the Capital Expenditure Claim and in the form of an investment allowance.

The first essential in every farm disposal system (unless an organic irrigation system is installed) is to separate clean water from foul drainage. The former (which may include clean yard, roof and cooling water) may be run directly into a ditch or stream, but any contaminated liquid from paved areas, dairies and milking parlours, fuel stores, sheep dips, etc., must be dealt with as foul drainage.

The second step is to separate the solid matter in a settlement tank. Its size will depend on the volume of effluent produced, the frequency of sludge removal and the method selected for the disposal of the liquid. A tank which is equally suitable for sludge settlement or storage is illustrated on page 25.

If the settlement tank is to be used only for sedimentation, with the liquid being allowed to pass through for disposal elsewhere, it should be big enough to hold the *maximum daily flow* of effluent from the buildings and paved areas which discharge into it. De-sludging will be necessary at about weekly intervals.

If, on the other hand, the settlement tank is to be used for storage, with no outlet provided, its capacity will depend on the frequency of emptying. The larger tank will be more expensive, but less labour will be needed to empty it. Capacity for one month's storage is a reasonable compromise between capital and labour costs, but on farms which are wet for long periods the storage period may have to be longer.

Either of two main methods of disposing of the contents of the storage tank can be used: (a) by wheeled spreader tank or (b) by organic irrigation plant. Both methods have the advantage of returning valuable nutrients to the land, but the first, though cheaper, has the disadvantages of higher labour costs, coupled with the possibility that the times for emptying the storage tank may coincide with wet soil conditions. For the small farmer, emptying by a trailer tanker, with a pump operated by the tractor, has much to commend it. When the land is wet the connection of a few lengths of spray line will

enable the tractor and spreader to stay on a hard road while discharging the contents on to an adjacent field.

Disposal of liquid

A variety of methods for disposing of the settled liquids from the settlement tank offer themselves.

Blind Ditch

Excavate a channel without any outlet, preferably parallel to and about 5 ft from an existing open ditch. The liquid discharged into the blind ditch will be disposed of by seepage and evaporation. Make the bottom of the blind ditch at a higher level than the open ditch and, if the ditch has an appreciable fall, build cross baffles of concrete, brick, masonry or hardwood at intervals. Fence it against stock. A ditch 2 ft deep and 2 ft wide at mid-section will hold about 25 gallons per foot run, but the length required will depend on the daily volume for disposal and the porosity of the soil.

Soakaway

Construct it as a chamber with walls of open-jointed brickwork or as a pit filled with hardcore. Protect it against silting from the topsoil by covering with a slab or slabs of stone or concrete. Its capacity, like that of the blind ditch, will depend on the daily volume of liquids and the porosity of the soil, but one day's capacity should be the minimum.

Surface Irrigation

A series of open channels conducts the liquid from the settling tank to a point where it is allowed to run over the surface of the ground and there be lost by seepage, evaporation, or by being taken up by herbage roots. Divide the area into two equal parts, so that one may be flooded while the other is rested.

Underground Field Pipes

This system is similar to surface irrigation, except that instead of the liquid being run through open surface channels it is distributed through agricultural land drainage tiles laid in clinker, gravel or broken stone. With either method, the porosity of the soil and volume of liquid for disposal will govern the area of land needed. (Example: an area 120 ft x 60 ft should, under average conditions, be sufficient for a 50-cow herd; if the soil is very free-draining, only half this area may be needed; if it is very impermeable the system may not be practicable.)

Ridge and Furrow

If grass or waste land is not available for disposal the liquid may be fed into the highest furrow of sloping ploughed land, all the furrow ends having first been closed. The liquid will then overflow down the slope from one furrow to the next. After a time the land may be reploughed and used again.

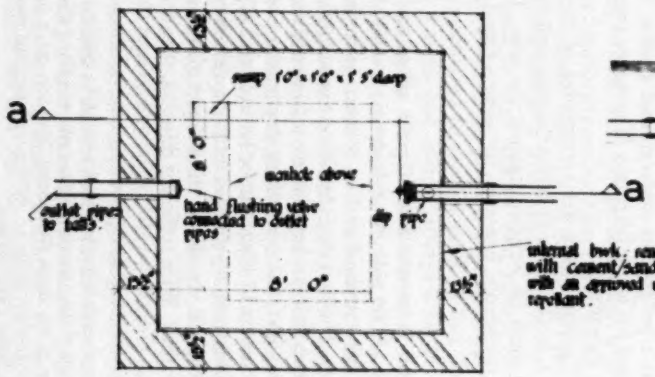
Lagoons

Lagoons can be used to receive either effluent from which the solids have been removed in a settling tank or a mixture of solids and liquids. They work on the principle of evaporation and self-purification by oxygenation over a large surface area of a shallow basin filled with effluent. A depth of only 2½ ft is recommended, and at this depth about ½ acre would be required to deal with 500 gallons of effluent a day. Though there is not yet a great deal of experience of this system in this country, it may come into greater use on farms with an impervious soil which is unsuitable for other systems dependent

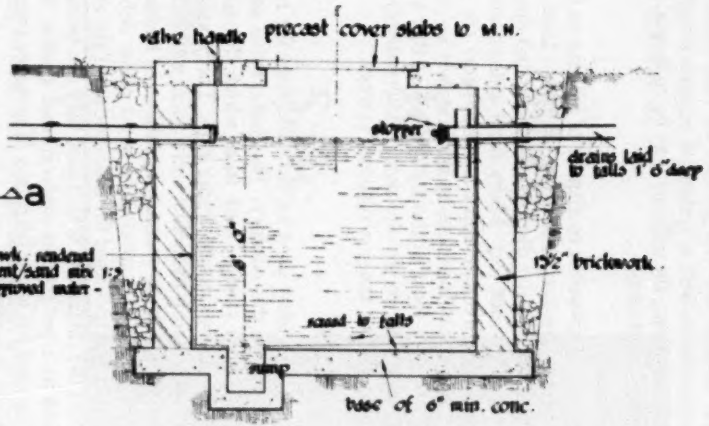
Tank suitable for sludge settlement or storage

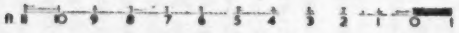
Capacity 2,400 gallons

plan



section a—a





solely or partly on seepage into the ground for their effectiveness. Lagoons may be used in conjunction with a system of organic irrigation and, subject to the River Board's consent, the effluent may be sufficiently self-purified for discharge into a river or stream.

Removal from the Farm

For those who find it impossible to dispose of effluent on the farm, perhaps because their buildings are surrounded by another's land, or because they have insufficient land for effective disposal, and who find discharge to a public sewer is impossible, all is not lost. Many local authorities are prepared to empty the contents of settlement tanks and transport the contents to their treatment works where the effluent can be fed in slowly so as not to overload them. In the absence of a local authority service of this kind, private contractors are often available to do the work. Alternatively, a neighbouring farmer may be prepared to share a disposal system.

Organic irrigation

This system has been widely used on the Continent for many years and is gaining ground rapidly in this country. The dung, urine and washing-down water is discharged into a storage tank from which the mixture is piped to the fields and distributed by portable spray guns. The mixture must be stirred up in the storage tank to keep the solids and liquids well mixed; the agitation is usually done mechanically by means of paddles or by multi-vaned centrifugal pumps. Both pumps and spray guns must allow debris such as straw and grit to pass through. Pipes used for distribution of the effluent to the land can either be laid on the surface, in which case they can be moved as required, or they can be laid as a permanent underground system. In either case the same system can be used for water irrigation of crops or grassland in summer, as well as for organic irrigation.

Though organic irrigation is the most expensive of the disposal systems described, the benefits, in the form of labour saving and return of valuable nutrients to the soil, must be weighed against the cost. These benefits can often be obtained more cheaply, however, by using a liquid manure spreader.

Silage effluent

The liquor produced from one ton of grass silage can be equivalent in polluting character to 12,000 gallons of domestic sewage. It is impossible to treat it to an acceptable standard and so it must never be allowed to contaminate a watercourse. The first step should be to obtain as high a dry matter content as possible, and this can be done by wilting the crop and by roofing the silo. By this means, and with a resulting dry matter content of 25–35 per cent, the liquid from one ton of silage can be reduced to 2–2½ gallons.

Silage effluent should normally be run into a soakaway if the soil is sufficiently porous; otherwise it should be discharged on to land by one of the methods already described. With sufficient dilution, it can also be discharged into a lagoon.

Because of restrictions on space it has not been possible to describe here all the methods of effluent disposal in detail. Fuller descriptions are given in Fixed Equipment of the Farm Leaflet No. 21, *Drainage of the Farm Homestead*. You can get it from H.M. Stationery Office or through any bookseeller, price 1*s*. Advice on individual problems can always be obtained from the Agricultural Land Service.

A Merchant looks at

Hay for Sale

A. Charlton Abbott

Hon. Sec. British Hay and Straw Merchants Ass'n

WHILST a lot of hay is sold from farmer to farmer, a proportion of it passes through the hands of the local corn merchant. The latter, however, is generally not well equipped to handle hay. His lorries haven't the necessary fore-racks and end ladders which enable a worthwhile load to be carried; nor have his drivers the experience to load quickly and safely. It is then that the hay merchant proper comes into the picture. He has specially equipped vehicles, and moreover he is prepared to carry a stock of hay throughout the season. Thus he is always a seller and almost always a buyer.

Outside purely local sales, the main movement of hay in the British Isles is from the drier arable areas on the east side to the wetter western areas. Dairy farmers concerned mainly with intensive milk production in these wetter areas, and hill farmers, whose land yields poor crops of hay, often secured under great difficulties, are the largest regular consumers of 'imported' hay. There are also ever-growing numbers of racing and hacking horses. A good many calves need specially 'soft' hay, often not found on the arable farm. The keeping of sheep indoors may also provide an outlet for surplus hay, but this system has probably not yet caught on sufficiently to make any appreciable impact.

The most saleable type of hay is probably that from second-year leys—real meadow hay. The dairy farmer prefers it, and generally speaking, the 'softer' it is the better. For calves, hay from a really old ley or permanent pasture is desirable. The riding horse and the race-horse require a first-year ley composed of ryegrass and a small percentage of clover. Sainfoin hay is popular with race-horse owners, but the quantities now grown are extremely small.

Buyers will usually pay more attention to the way the hay is harvested than to its constituent grasses, and, indeed, palatability is an all-important point. The ideal hay should be cut young just at, or before, the flowering stage, and cured as quickly as possible, so that the resulting hay has plenty of leaf, good colour and a nice silky feel.

Making, not marring

It is not within my province to discuss the merits or otherwise of various conditioning machinery. No machine can replace good, hot summmer weather, but tedders and crimpers can materially reduce the time of preparation before baling. The Silorator used as a tedder can also produce a very satisfactory quality hay, but with clovery hay in particular losses can be appreciable. The old method of 'cocking' gave very good results, but is now too expensive. Making hay on tripods seems also to have the same disadvantage. One wonders, however, whether too much emphasis is laid on making 'cheap' hay and too little on 'quality' hay. Most merchants say they find few growers who can supply them every year with sound hay, no matter what the weather.

Baling hay for sale is a most important point to watch. Much of it is baled too lightly. After a few months in the barn it gets loose, with consequent wastage. One of the biggest costs the merchant has to bear in selling hay is transport. He must, therefore, have hay in firm, well-shaped, bales, which will load well and which, when his lorry arrives in the buyer's yard, will present a pleasing sight. Wire-tied bales give better loading because they are generally considerably heavier than string tied, but buyers object on the score of the risk of cattle swallowing small bits of wire. Whether wire- or string-tied, the bales should weigh between 40 and 80 lb.

The vagaries of our weather can, of course, be completely overcome by barn drying. The resultant product is a very satisfactory feed, but the process is relatively slow and is generally carried out by farmers for their own use; hence very little is offered for sale. If barn-dried hay were available in quantities at a reasonable premium over field-dried hay, it might well command a useful market. It has the advantage of being of a constant quality, a feature not to be found in field-dried hay except in exceptional summers.

Keep up the quality

Inconsistency of quality is indeed one of the main problems that beset a merchant. Having satisfied a customer with a load of hay, he is often in difficulties when given a repeat order for the same quality. It is interesting to note, in passing, that Canadian hay is of such regularity that it is Government graded and sold, like Canadian grain, on description, e.g., No. 1 Timothy hay; No. 2 Timothy hay, etc. The buyer knows from the grade exactly what quality he will receive.

There is an increasing tendency nowadays to sell hay as soon as it is made 'off the field'. This method certainly relieves the seller of a lot of work, but he also receives a poorer price because the merchant has to compensate for the heavy loss in weight which takes place in the first three months or so after harvesting—a loss which can be as high as 20 per cent. If hay is to be sold 'off the field' it must at least be put into sledge heaps and covered in some way. It is very unfair to expect a merchant to have his lorries hanging

about waiting till the farmer has managed to get his hay baled, only to find it left in single bales round the field, and the weather just about to break!

Of course, hay is better stored in Dutch barns, with the weather side properly protected. There should be good access, by hard road, in all weathers and sufficient space to turn lorries round when loaded. If hay must be stored in ricks outside, then they should be thatched properly and plenty of dunnage placed under the hay before it is stacked. Polythene sheets, in my experience, do not appear to give suitable protection; water condenses under them, forming mould on the hay, and they are not easy to keep in place in high winds.

To get a good price

If you want to make a good price for your hay (and who doesn't?), give your buyer good quality stuff. Don't expect him to take all the rough and outside bales, and pay you full price. Put yourself in the place of the ultimate buyer and ask yourself if you would accept a proportion of bad bales on each load you had ordered. If there are a quantity of partially-damaged bales, have them rebaled, taking out the damaged portion. Give your buyer's driver help to load. A merchant cannot afford to have two men on each lorry, one of whom would spend most of his time looking at the scenery while he is being driven along; and you certainly can't expect a man to load a lorry on his own. Remember too that in most cases the final buyer is, like you, a farmer.

Winter Keep Scheme

WINTER keep grants of £2 per acre each year during the period 1964–66 are available to certain livestock rearers in upland areas under the Scheme which started on 1st January. The grants are payable to those who occupy farms consisting predominantly of livestock rearing land and livestock-rearing enterprises, and they are in respect of approved crops grown for winter feed on the farm, as follows:

- grass for drying, hay or silage provided it is kept ungrazed for a substantial part of the growing season;
- any other crops grown exclusively for silage;
- oats, turnips, swedes, kale, cabbage, rape, mangolds, fodder beet, beans, peas, kohlrabi, vetches, tares and any mixture of two or more of these crops.

Any hill farmer who is interested in the Scheme should immediately obtain the explanatory leaflet and application form now available at the Ministry's local offices.

TURKEYS

Is there a breeding problem?

D. M. COOPER

•

A. E. BEER

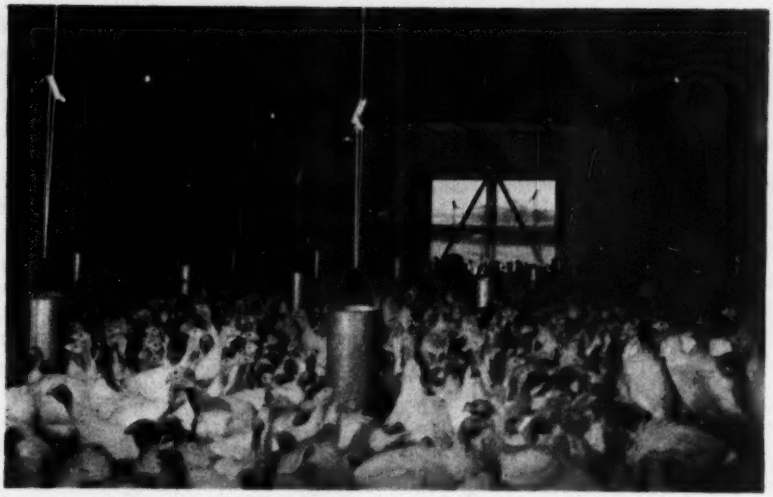
The answer to this question was sought in an inquiry, based on a questionnaire carried out jointly by The British Turkey Federation, the Houghton Poultry Research Station and the Ministry of Agriculture, in respect of the 1961 breeding season.

DURING the 1959–60 season there were mounting numbers of field reports that infertility and poor hatchability in turkey flocks were seriously affecting the economics of production. The breeding programme of British turkey producers has been to increase breast width and body size, and while very rapid strides have been made in the production of meat-type stock, selection for reproductive fitness in many flocks appears to have been neglected. Artificial insemination of broad-breasted stock has been used increasingly since 1955, and although that may help with very broad-breasted stock unable to mate naturally satisfactorily, it has not of late always overcome the problem of poor fertility; and this particularly so when there has been a sharp fall in fertility after 6–8 weeks of egg production.

The flocks

A total of 129 questionnaires was received from 32 counties in England and Wales, 2 from Scotland and 1 from Northern Ireland. Forty-nine flocks had 150 breeding hens or less; 43 flocks 151–500 breeding hens; 16 flocks 501–1,000 breeding hens, and 20 flocks more than 1,000 breeding hens. One flock was of unspecified size. Fifty flocks were classed as 'closed' for an average of 6·6 years, range 2 to 15 years. There seemed to be some doubt by some breeders as to the meaning of the term 'closed', and in view of the widespread incidence of Newcastle Disease in 1959 and 1960, it seems remarkable that 36 of the 129 flocks could have been closed for five years or longer.

Slightly more than 95 per cent of the breeding hens were first-year birds, and selection of breeding stock was based (generally visibly) on breast width, keel and shank length. Body weight was used as a criterion by most breeders. Few flocks were trap-nested, as is shown in Table 1. Only four flocks trapped more than 200 females, and the number of trap-nests used in these flocks accounted for 67·7 per cent of all trap-nests used. Slightly over one-third of the flocks were said to be selected for reproductive fitness on the basis of



These broad-breasted white turkeys on Mr. John Lintern's farm at Great Kingshill, Bucks, were got solely by A.I. They are being reared intensively in a house 150 ft long by 30 ft wide, 2½ sq. ft being allowed per bird

hatch records. Twelve flocks (9·3 per cent of total) gave no information as to selection for these traits.

1. *Number of flocks in which some birds were trapped*

Number of flocks	Number of trap-nests
6	1—20
2	21—50
5	51—100
2	101—150
3	151—200
2	201—500
2	over 500
22	

Housing and feeding

Some 53 per cent of the breeders were kept intensively either in pole barns, converted yards or buildings. There was no information from 5 per cent of the flocks, but the remaining breeders were kept either in fold units (11·6 per cent) or in various units to which a grass run was attached (30·2 per cent). Cages totalled only 348 from five flocks, due probably to the difficulty of keeping birds on wire floors with subsequent loss of settable eggs through cracks and breakages. Straw and wood shavings were used for floor and nest litter, this choice no doubt depending on the availability of the material to the farmer.

Home-mixed feeds were fed to 20 per cent of flocks during the growing period, whilst the remainder were fed proprietary feeds, mainly pelleted. Grain was fed in varying amounts in 62·7 per cent of flocks, and potential breeders were kept in 'store' condition in 66·7 per cent of flocks. Drugs were fed prophylactically against salmonella infections in 11·6 per cent of flocks,

for blackhead in 58·1 per cent of flocks and curatively for worms in 12·4 per cent of flocks. Breeders were fed mainly on proprietary feeds, with some flocks being given small quantities of grain in addition to the breeders ration. Drugs were fed less frequently to breeders, at prophylactic level against blackhead in 26·4 per cent of flocks and curatively for worms in 14·7 per cent of breeding flocks.

In the majority of flocks natural day-length appeared to be used for rearing and for bringing breeders into production. Some 60 per cent of replies gave no indication of day-length or lighting patterns used.

Egg production was variable and the number of flocks with average egg number is given in Table 2. No figures were given for 17 flocks. There were 107 flocks which returned results on egg production and length of season, and using these figures the average number of eggs/bird during a period of 160 days was 61·5. Only 6 flocks showed a drop in egg production during the season which could be attributed to disease.

2. *Number of flocks with average number of eggs per bird*

Number of flocks	Eggs/bird
2	30 or less
9	31—40
15	41—50
31	51—60
25	61—70
22	71—80
8	over 80

Mating

Twenty-five flocks (19·4 per cent of total) were mated solely by A.I. and based on returns from twenty flocks, fertility averaged 68·3 per cent and hatchability 83·7 per cent of fertile eggs. The other five flocks gave no details. Ten flocks (7·8 per cent of total) were mated naturally and supplemented by A.I. Based on returns from 8 flocks, fertility averaged 67·5 per cent and hatchability 72·2 per cent of fertile eggs. Eighty-seven flocks were mated naturally and averaged 72·2 per cent fertility, with 79·9 per cent hatch of fertile eggs. Whilst these figures show reasonable fertility and hatchability over a 23-week season, the number of flocks at varying levels of fertility is shown in Table 3.

3. *Number of flocks with varying levels of fertility*

Number of flocks	Per cent infertile
3	1—10·0
5	10·1—15·0
13	15·1—20·0
21	20·1—25·0
10	25·1—30·0
22	30·1—35·0
9	35·1—40·0
13	40·1 or more
11	Insufficient data on which to base a calculation
22	No information given

In the group with the highest level of infertility, three flocks had serious infertility problems, with fertility being 33·5, 40·8 and 43·4 per cent respectively. A further four flocks had an average fertility between 53 and 59 per

cent. Further investigation of these seven flocks showed four to be large flocks of more than 1,000 breeding hens, and three flocks with 201–450 hens. Three of the flocks were mated solely by A.I., one flock mated naturally and supplemented by A.I., and three flocks mated naturally. Returns from three of the seven flocks indicated that symptoms of sinusitus had been observed during the year in question.

Three flocks had a serious hatchability problem, with hatch of fertile eggs averaging only 48·2, 55·3 and 57·4 per cent respectively, while a further seven flocks averaged 60–70 per cent hatch of fertile eggs.

Observations: the yardstick

The overall impression gained in examining these returns is that many people appeared to be relying heavily on memory when completing the questionnaire, many figures being rounded off to the nearest ten or hundred. A particularly disappointing feature was that one-quarter of the returns gave insufficient information on fertility and hatchability to make the return of any real use.

Examining the 1961 results, it does not seem unreasonable, with few exceptions, to believe that fertility *was* a problem; but it does depend to a large extent on the yardstick being used. If it is a case of 90 per cent fertility and 90 per cent hatch of fertile eggs over a long season, then we have a very long way to go. The eight flocks which had an average of 85 per cent fertility were of the following sizes: one with 1,000+ hens, one with 700 hens, one with 400 hens, and five flocks with less than 100 hens each. In deciding on the yardstick of fertility and hatchability, the length of the breeding season must be considered, and some breeders may well find that it could be more profitable to shorten the season. This may easily be determined by summarizing the results of hatches for the first four weeks, second four weeks and so on. If these results were then correlated with egg production it would be apparent as to when the optimum time for disposal of breeding stock was reached. No doubt breeders will find that particular strains of turkeys vary in production and fertility, both actually and in degree of persistence.

Underlying causes of poor hatching

Poor hatching can result from feeding an inadequate ration, either because of incompleteness of the ration or because of dilution by feeding excess grain. Nutritional effects, however, are often not evident until the middle and late stages of incubation. It may also be caused by poor quality semen, although under usual A.I. practice semen which is thin and watery is discarded. Early embryonic mortality may often be classed as infertile if candling only is carried out.

Perhaps of greater importance is the frequent collection and proper storage of hatching eggs prior to setting. Inadequate hygiene measures may result in dirty eggs with consequent effects on hatchability. The use of white wood shavings as nest-box litter is to be preferred to hay or straw, and frequent changing of the litter in the nests to ensure collection of clean eggs is a better policy than washing or dipping hatching eggs. If, however, germicidal dips are used, the manufacturers' instructions must be followed exactly, particularly as regards concentration, time and temperature. Lack of attention to detail in incubation can lose many poults. Environments vary from hatchery to

hatchery, and it is essential to work with the manufacturer of the machine, making adjustments and developing techniques until results are satisfactory.

Complete records a great help

From the results of this survey it seems that reproductive fitness in some flocks is in need of improvement. In some instances this may be effected by relatively simple measures, but in others it would appear to be more complex. In the 1961 season, however, it did not appear to be a problem on a national scale. Nevertheless 1963 field reports suggest an increasing number of flocks with an infertility problem occurring at about 7–8 weeks of production.

The value of keeping records with frequent summarizing cannot be over-emphasized. It is not only through the keeping of complete records that the breeder will see his year-to-year progress, but should trouble occur he will have considerable detail to place before his agricultural or veterinary advisers in attempting to solve the problem.

The authors are indebted to Messrs. Spillers Ltd. for printing the forms used in this survey.

Miss D. M. Cooper is a senior scientific officer at the Houghton Poultry Research Station. **A. E. Beer** is a specialist in Embryology and Nutrition in the N.A.A.S. at Wolverhampton.

The Ministry's Publications

MAJOR PUBLICATIONS

Copies are obtainable from Government bookshops (addresses on p. 50), from Divisional Offices of the Ministry or through any bookseller at the price quoted.

Cattle of Britain (Revised) 6*s*. (by post 6*s*. 7*d*.)

An illustrated guide to British breeds of milk and beef cattle.

LEAFLETS

Single copies of Advisory Leaflets, up to a maximum of six different leaflets, may be obtained free on application to the Ministry (Publications), Government Buildings, Tolcarne Drive, Pinner, Middlesex. Copies beyond this limit must be purchased from Government Bookshops, price 3d. each (by post 6d.).

ADVISORY LEAFLETS

No. 16. Coccidiosis in Chickens (Revised)
No. 57. Wingless Weevils (Revised)
No. 224. Red Spider Mite on Glasshouse Crops (Revised)
No. 292. Pink Rot and Watery Wound Rot of Potatoes (Revised)
No. 358. Onions (Revised)
No. 434. Home Freezing of Fruit and Vegetables (Revised)
No. 524. Feeding Bulky Foods to Dairy Cows (New)

MACHINERYWISE

Spinning Disc Fertilizer Broadcasters

UNEVEN fertilizer distribution is a common cause of 'stripes' across a crop, and is often due to the use of an unsatisfactory broadcaster or to unskilled operation. On grass, striping is usually unimportant, but uneven dressing of a corn crop with nitrogen can reduce the return for a given application of fertilizer. It may also have important side-effects; e.g., uneven growth or ripening, or it can cause strips of crop to go down.

The choice of a satisfactory broadcaster has been made easier in recent years because of a fairly general improvement in machine performance, and because there is more information available. But, unfortunately, some farmers choose distributors to spread expensive fertilizers on price alone, without any attempt to obtain information on (or even to guess at) the important aspects of performance, e.g., ease of setting, operation and cleaning, rate of work and durability. With some notable exceptions, the cheapest machine in a given class is not necessarily the best for all farm conditions. It *may* be false economy to buy a small or cheap machine; the extra cost of the more expensive distributor can be a mere flea-bite in relation to other costs, and can easily be justified if a more expensive machine meets the needs of a particular holding better than its cheaper rivals. N.I.A.E. test reports are a useful source of information on machine performance.* If no report is available, do a little 'digging' for other people's opinions.

*For example, under the new Users' Testing Scheme, the N.I.A.E. has recently started a test of 19 broadcasters. A report on the first part of the work has been sent to all subscribers to the Scheme (details can be obtained from the N.I.A.E., Silsoe, Beds).

Not easy to use

Although mechanically simple, spinning disc machines are not easy to use. A good grasp of their operating principles is essential. A skilled and conscientious operator is a 'must' for good results. When setting spinning disc broadcasters, the main point to bear in mind is that quite large variations in evenness of distribution are not visible in practice. To achieve good results, great care must be taken in setting.

The disc speed must remain constant and the manufacturer's recommendations followed closely. Apart from the obvious effect on the width of spread, a change in speed can sometimes affect the 'balance' of the spread pattern by causing more fertilizer to go on to one side than the other. A tractor tachometer is essential for good results.

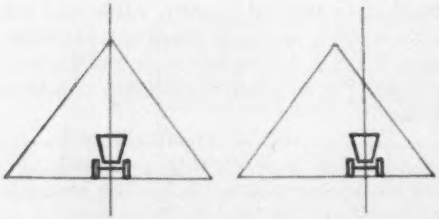
The spread control setting must be right (if this can be adjusted); if set incorrectly an unbalanced pattern results. The 'overlap' between bouts must also be correct. If the instruction book doesn't help (it should, but regrettably often does not) it is possible to check the 'balance' of the spread pattern. Choose a calm day and run the machine (tractor stationary) for about a minute, in a concrete-floored yard (or building) of suitable size and with a clean surface. If convenient, the machine can be placed 15–25 ft from a wall. Then divide the material lying on the ground along the fore-and-aft centre line of the tractor, sweep up the two sides of the spread separately (A and B in the diagram on p. 37) and then weigh the two batches swept up. Weighing is essential; judgment by eye is not sufficiently accurate.

If the quantities are not about the same, reset the spread control of the machine accordingly and repeat the procedure until you get a setting where the same amount is spread to both sides.

Test for width of spread

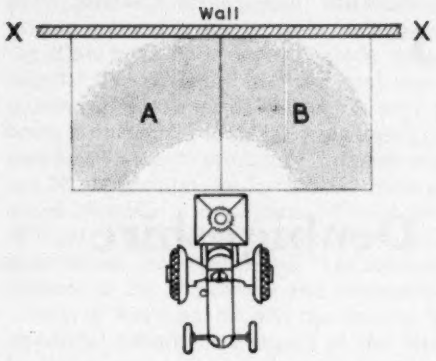
Don't try to estimate the optimum width of spread (distance between bouts) when spreading on the concrete floor; fertilizer bounces and you are sure to be wrong. This must be done in the field. Spreading a little fertilizer on a bare fallow, seedbed or short grass can be a help if the field conditions under which spreading is actually to take place are such that it is difficult to see the fertilizer on the ground. However, don't forget that you may have to allow for the height of the crop.

Having decided what bout width to use, keep to this width, using markers if necessary (as is usually the case where the bout width exceeds 7 yd or thereabouts). Guessing the bout width from the tractor seat will give uneven distribution, also the rate of application will probably vary from one side of the field to the other (even from bout to bout).



Left. *Correctly balanced spreading pattern, with equal quantities thrown to each side of machine*

Right. *Pattern given by faulty machine, or with spread control wrongly set. Too much fertilizer is thrown to the left, making it impossible to overlap to give an even spread across the field*



This diagram illustrates the method of checking the balance of spread which is described opposite

Carry out these checks with the machine set to apply at approximately the right weight per acre—say within 1–2 cwt on either side of the rate desired; this is because the spread controls of some machines have to be set in different positions for different rates of application. Now set the feed rate to give the exact rate required, by applying 1 cwt or so, running until this quantity has been spread, calculating the area spread, and adjusting if necessary.

Don't spread on windy days, because the pattern will be affected by the wind. The spread controls of some machines can, it is claimed, be used to offset the effects of a side wind. Such an adjustment may make it possible to do a poor job (as opposed to an entirely unsatisfactory one) on a windy day, but the difficulties in setting and the bother involved in resetting at each end of the field often make the use of this adjustment impractical under farm conditions.

Don't use a damaged or worn machine. Very small amounts of wear or apparently minor damage to the disc or feed control, etc., can ruin the evenness of distribution.

Clean out the machine thoroughly—hose it down with plenty of water. Try to prevent too much fertilizer being caked on to components; if left, this will only be all the more difficult to remove eventually, and it may affect performance.

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12. North-East Denbighshire

O. J. Denyer

WITH a cordiality that would probably have horrified those eighth century dyke-diggers, Wat and Offa, the roads from the East into the district now bear the friendly sign 'Croeso i Gymru'. That it is not only tourists that are welcome, is evident from the spread of progressive farming techniques over the border from neighbouring Cheshire and Shropshire.

Centred on Wrexham, the district is bounded on the east by the River Dee, to the west by the Vale of Clwyd, and is split from north to south by the high spine of the Clwydian Range. Low-lying and flat by the Dee, the land rises to over 1,500 feet in the hills, with the 1,800 feet Moel Fammau standing out at the extreme northern tip of the district.

Industry in the area is confined to Wrexham and the surrounding villages, and owes its origin to the underlying coal seams. Coal mining is still the most important industry, though in recent years it has been centralized on four main pits, including Gresford, tragically remembered for one of the worst disasters in British mining history. Overgrown slag heaps in many of the villages bear witness to the small pits which were once numerous but have now been abandoned. The production of high-grade steel and of chemicals are the other important activities, though there is a sprinkling of light industry in the area. In contrast to the once depressed, now flourishing, coal mines, are the once flourishing lead mines in the hills, now only a memory to even the oldest inhabitants and, on occasions, a source of anxiety to farmers with old shafts on their land.

Agriculturally, the district falls into three distinct regions. Around Wrexham, the rather flat country of the coal measures is overlain by boulder clay, interrupted by sometimes large deposits of glacial sand and gravel, giving, in general, well-drained fertile soils. With its 30 inches of rain per year this is excellent country for growing grass, and indeed it would be difficult, without signposts, to tell that one had left the Cheshire plain.

Milk production is the main object on ninety per cent of the farms, and herds of black and whites predominate, though there are a number of first-class Ayrshire herds. Few holdings consist of much more than 100 acres, and these dairy farms are intensively managed with high stocking rates and

good grassland management. Self-feeding of silage is commonplace and interest is being shown in the barn drying of hay. In an area where much of the straw must be imported, cubicle housing of cows is quickly becoming popular. Production of beef and lamb does not figure largely in the farming economy. Next to the dairy cow, the pig is the most important animal, there being a number of large fattening enterprises which finish the considerable number of weaners produced. Although high yields of cereals and cash roots can be obtained on this fertile soil, where arable crops are grown they stand out as islands in a sea of grass. Mention must also be made of the small area of highly fertile sandy loam around Holt, where heavy crops of first-class strawberries, bush fruits and vegetables are readily absorbed by the large markets in the Manchester and Merseyside areas.

West of Wrexham the hills rise sharply, and from the first ridge provide a wonderful panoramic prospect of the West Midland plain. The prospects for the farmer in these hills are not so bright. Narrow valleys cut the hills in several directions, and these have good deep soils which support small family dairy farms. But much of the land is steep and thin soiled, with the limestone rock outcropping in many places. The more level areas of high land are generally acid peaty moors, heather covered and difficult to drain. The high rainfall (45–60 inches annually) and winter snows add to the difficulties of the farmer. The small dairy farms in the valleys, which constitute only a minor proportion of the total, are being forced by economic circumstances to become more intensive. The grazing season is being extended with the use of short leys and rye, and more attention is being given to conservation of better quality hay and silage. Amalgamation of holdings is taking place slowly and this trend, combined with intensification, should ensure a reasonable living on these small family farms in the future.

In recent years, with the aid of Marginal Production and Hill Farming Schemes, many of the farms in the hills have been greatly improved. Steep, difficult hillsides have been cleared, cleaned and reseeded, generally with good results. The advance up the hillsides, and even over the tops, of better grazing land is very noticeable, but it is doubtful if the remaining areas of heather- and bracken-infested slopes and moors would pay for reclaiming, even where physically possible. Production of weaned calves, beef stores and lamb is the main occupation of the farmers in this area, and with the improvement of the hill land many more of the lambs are sold off fat than formerly. The native Welsh Black is well represented among the beef herds, and on the hill grazings the Welsh ewe thrives, producing a useful lamb when crossed with the Suffolk. Although output from these farms does not approach that of lowland farms only half the size, costs are generally low and margins are reasonable on the larger holdings.

The Vale of Clwyd, with its bodied sandy loam and favourable climate, gives rise to some good mixed farming. Milk production is prominent, but both beef and sheep are important on many farms and high yields of arable crops are obtained. Production of red clover seed, once a noted feature of the Vale, is now rare.

The overall pattern of the district is one of small livestock farms whose profitability depends on efficient exploitation of the grassland. There is no doubt that this factor is appreciated by the majority and grassland management is continually improving.

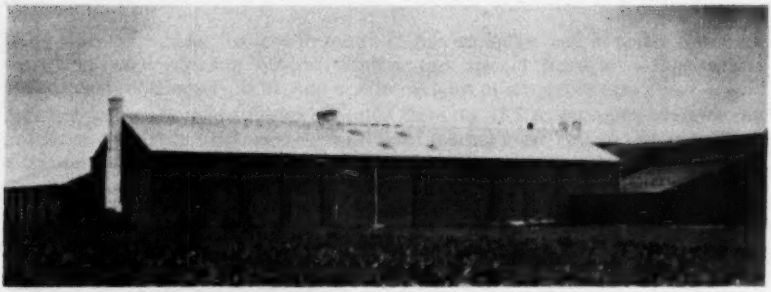
GEORGE YOUNG
Agricultural Land Service, Lancs

Mushroom Development

IN the flat and fertile plain of South-west Lancashire, near the seaside resort of Southport, there is a new feature on the skyline which can rightly be described as 'mushroom development'. This does not refer to the rapid growth of a new project or to a building which is in any sense out of place. The new erection is part of the plan which MR. N. OLVERSON has evolved for the modernization of his mushroom-growing business. The area is one in which this industry flourishes, with a ready market on the doorstep for a regular supply all the year round.

Since the Horticultural Improvement Scheme came into force, Kershaws Farm, Scarisbrick, has been the scene of various building operations, not all of which could qualify for assistance under the Scheme. A new packing shed, a cold store, and a new heating system were the first of the improvements carried out to increase the efficiency of growing and marketing the produce from some 40,000 sq. ft of mushroom trays. Four crops a year are produced. The most spectacular improvement has just been completed. This started as a project to house the processing of the compost, with a building 70 ft wide by 78 ft long, but this building has now been enlarged by 1,800 sq. ft. The new processing area includes two peak heating houses, in which the compost is sterilized by holding it at a temperature of 140°F for at least 24 hours. Adjoining these houses is the storage area for raw materials, part two-storied, a covered area for treatment of compost after sterilization,

Interior view, showing the roof trusses and loft



The new house, with the compost yard at one side

and two spawn running houses each 20 ft wide and 45 ft long. The peak heating houses are the focal point of this new layout, and each has room for some 4,500 sq. ft of trays at a time.

The design and construction of this building had to combine strength with a very high degree of insulation, and also meet the requirements of the Horticultural Improvement Scheme. The external walls are built of brick, and those sections which are also part of the peak heating rooms are made with a 2-in. cavity. The roof is carried on 18-inch piers which support timber trusses of the T.D.A. standard industrial design. The timber is all pressure-treated against rot. Asbestos sheeting is used to roof the whole area.

Inside this structure, the two peak heating houses, with wide fluctuation of temperature and extreme humidity, created problems both in building construction and insulation. Two walls are also external walls and the others internal. All these walls, including the partition between the two rooms, are of cavity construction, with the cavities formed so that they are continuous and not broken by the piers. The external facings are best quality bricks, and the internal, concrete blocks with high insulation properties. The two skins are bonded together with wire ties.

A false ceiling, 14 ft 6 in. high above floor level, is constructed of timber joists suspended from the timber trusses. Expanded metal rendered with cement forms the surface of the ceiling. The floor is made of 6-in. concrete with a hardened surface to withstand constant use by fork-lift trucks. The inside of these rooms is heat-and-vapour proof. The ceiling insulation is above the joists and consists of four layers of bitumen bonded fibre glass on 1-in. insulation board. The walls are rendered internally with sand and cement, to which a proprietary plasticizer has been added. The whole of the walls and ceilings is coated with Foliac paste, trowelled on, a painting of vapour-proof aluminium paint, another layer of paste, and a final coat of the paint. The interior appears to be vapour-proof even at the high temperature and humidity which is encountered. A steaming and ventilation plant complete the building.

The most recent addition has been a yard in which to make compost. In this yard a machine turns the compost mechanically, moving along the heap of materials in a continuous operation.

The whole of the modernization has naturally had increased efficiency as the watchword, but consideration has also been given to appearances and amenity. The new building is designed with pleasing lines and combines good looks with utility.

IN BRIEF

New Glasshouse Pest

A pest new to this country, the Mediterranean Climbing Cutworm (*Prodenia* species), has been identified on chrysanthemum plants in a number of glasshouses, mainly in the south of England. It is a potentially serious glasshouse pest, likely under favourable circumstances to be capable of breeding throughout the year and of infesting a wide range of crops, including tomatoes and lettuce.

The adult moth is variable in size (wing expanse $1\frac{1}{5}$ to $1\frac{4}{5}$ in.), fore-wings brown with white diagonal or zig-zag markings, hind wings white with brownish margins. When the moth is at rest the hind-wings cannot be seen.

Eggs are laid in groups of 100–300 on the underside of a lower leaf, and one female may lay 1,500–2,000. The groups of eggs are generally about $\frac{1}{4}$ in. in diameter and are covered by pale brown scales from the female's body.

The newly-hatched caterpillars are very small and pale green, with a dark area on the first abdominal segment. By the time the caterpillar is likely to be seen by the grower, its back is brightish- to blackish-brown with two pairs of black triangular blotches, one pair near the fore-end and one near the hind-end, and usually conspicuous. As the caterpillar grows, more paired black marks appear along sides between the two original pairs. Behind the head are two pairs of small yellow spots.

The fully-fed caterpillar (about $1\frac{1}{2}$ in. long) burrows into the ground and pupates in an earthen cell. The pupa is reddish-brown, about $\frac{1}{2}$ in. long.

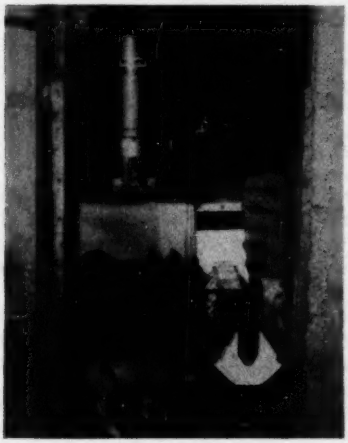
Any grower coming across moths, caterpillars or pupae which may answer these descriptions is asked to let his local Plant Health Inspector or N.A.A.S. officer know at once.

Yellow Spots

'Automatic Sow'

Early weaning enables the sow to return to service earlier and in better condition than traditional suckling systems. Piglets, too, benefit from an adequate and unrestricted food supply, achieving heavier weights at an earlier age.

A new automatic piglet feeder imported from the U.S.A. promises to overcome problems previously associated with artificial rearing aids. This machine provides a constant and easily accessible supply of sow-milk substitute by a combination of mechanical and electrical components. A built-in hopper holds 25 lb of 'sow milk' powder—from which a predetermined amount is dispensed, and mixed with water which is heated and measured automatically. The solution is then pumped to an open feed trough.



As the piglets consume the liquid to below an adjustable electrode in the trough, further mixing cycles ensure the maintenance of the set level. An electric element fitted in the underside of the trough keeps the mixture at the right temperature.

Taken from the sow at 6 to 7 days, the piglets quickly adapt themselves to drinking from the trough and, as the feed is taken *ad lib.*, one feeder is claimed to cope with as many as a hundred piglets. It appears, therefore, to offer a great potential for mass-production rearing—although, of course, some compensating adjustments may be called for in management.

The compact feeder mechanism is mounted out of the pen to simplify the daily cleansing routine which, by press-button operation and utilizing water from the pre-heat tank, can be accomplished in a few minutes. Water from the same source is used for trough cleaning and rinsing, a removable end-cap facilitating draining and disposal.

Feeding from the trough obviates the difficulty of inducing piglets to accept rubber nipples—and, of course, the cleaning of them also. Automatic maintenance of supplies removes manual mixing and re-filling of a dispenser, so greatly increasing the numbers which can be looked after.

Despite the fully automated operation, the electrical loading is small—consumption of electricity costing in the region of a shilling a day.

From the rather limited experience in this country, pigs reared on this 'automatic sow' appear to do extremely well—reaching normal weaning well before eight weeks. Such an ingenious machine could make a welcome contribution to the productivity of large-scale pig rearing enterprises.

Milk under 2/- a gallon

Yeo Vale is a farm of 230 acres near Bideford, Devon, mainly concerned with milk production from a herd of pedigree Friesians. The story of a ten-year change of policy from heavy feeding of concentrates (3·8 lb/gal) to a much greater reliance on well-managed grass, which I.C.I. tell in their booklet *A North Devon Dairy Farm, 1956–1962*, is as fascinating as it is important. In 1956 the cost of all food per gallon was 19·4*d.*; in 1962 it was down to 12·8*d.*—a *total* cost of production at less than 2*s.* per gallon. How's that for profitability? The booklet is free from any Sales Office of I.C.I.

Modern Trends in Cereal Drilling

Combine drills, with traditional 7 in. spacing, are fast disappearing from some of the larger farms in the intensive corn-growing areas. Continental-type drills, with 4 or 5 in. coulter spacing, have become fashionable along with developments in the bulk handling of fertilizers. The N.A.A.S. has been looking at this over the past three years in fifteen experiments in Berkshire, Hampshire and Oxfordshire. They compared 7 in. and 5 in. drilling of spring barley and spring wheat. All the test crops were, in the main, second or third successive cereals in an alternate husbandry system incorporating well-managed leys. Soil types ranged from gravelly loams to heavy clays.

Mean Yields from Experiments 1961–63

1.	Broadcast @ 7 in. 34·6 cwt per acre	*v*	Broadcast @ 5 in. 35·0 cwt per acre	0·4 cwt per acre in favour of 5 in.
2.	Combine drilled @ 7 in. 35·5 cwt per acre	*v*	Broadcast @ 7 in. 34·6 cwt per acre	0·9 cwt per acre in favour of combine drill
3.	Combine drilled @ 7 in. 35·5 cwt per acre	*v*	Broadcast @ 5 in. 35·0 cwt per acre	0·5 cwt per acre in favour of combine drill @ 7 in.

We found that variation in seed rate (within the range 120–180 lb per acre) did not materially alter the difference shown by the variation of row width or method of fertilizer application. Reducing seed rates did, however, counter serious lodging at two centres. And a mildew attack in susceptible barley at two centres was aggravated by narrower drilling.

On the other hand, narrow drilled crops showed better control of some difficult weeds following the application of selective herbicides. Stones or moderate amounts of trash did not prove to be a hindrance to the modern narrow coulter drill at any of the centres.

The South-East region experiments have shown that differences in spring cereal yields, following combine drilling as an alternative to broadcasting fertilizer, are much narrower today than they were on similar soil types in the 1940s. The actual differences in grain yield ranged from 3·5 cwt per acre in favour to 1·9 cwt per acre against combine drilling.

Whether or not a change in drilling systems on many similar farms is called for, is largely a management problem related to the efficient deployment of the labour and machinery available so as to allow timely sowing when soil conditions are favourable.

B. WILKINSON
R. G. HUGHES

Quote

Whatever the stage of sow management, there is no substitute for experience, and the 'stockman's eye'—with all that well-known phrase implies—will always be essential. But equally, in modern pig keeping, there is no alternative to recorded information. Without it no-one can begin to select seriously.

Gilts should only be selected from high performance sires and dams. The dam should have a consistent record of two litters per year, at least ten pigs reared per litter, and a litter weight, at three weeks, of not less than 140 lb. Selections should be made from matings known to produce progeny which reach marketable weight quickly, on the minimum amount of food, and which produce good carcasses.

From PIDA's new free booklet, 'Sow Management'.

Books

Farming with Kenneth Russell. KENNETH RUSSELL. Farming Press. 35*s*.

In this eminently readable book Mr. Russell ranges over a wide field. It opens with anecdotal and philosophical comments on the nature of farming and the qualities of those engaged in it, and passes through illustrations and discussions of the business approach to farming problems to a concluding chapter on farming in the future.

With such a wide range within a comparatively small book, many topics are inevitably treated rather cursorily. Very many people will find something of interest in this book, but it cannot be regarded as a text-book for students nor a blueprint for farmers.

A substantial part is devoted to applying business analysis and planning techniques to farm management problems. But despite the considerable use made of economic and financial data in illustrating techniques of analysis and planning, it is evident that Mr. Russell's interest remains primarily in 'good' husbandry rather than the pure £ *s*. *d*. of farming. Thus, for example, he states that the aims of his farming at Shuttleworth are to grow as large an area of cash crops as possible, to plan livestock enterprises to make full use of buildings and equipment or to spread labour demand throughout the year, and so on. It is true that these features are often characteristic of profitable farming systems, but they are not the primary aims of a true businessman farmer. The primary aim in a true business sense would be to earn the maximum continuous profit; and high and stable profits are not inconsistent with unused buildings or uneven labour demands.

One could question many of Mr. Russell's detailed managerial decisions on similar grounds. For example, he concludes that sealed tower silos, at an initial capital cost of about £7,000, would be a reasonable proposition at Shuttleworth simply on the grounds that the additional cost would amount to only £3 16*s*. per cow a year and that there would be intangible gains in the precision of making and feeding silage. Intangible gains are poor grounds for heavy capital expenditure, and it would be much more relevant from a business point of view to determine whether investment in silos represented the most profitable use that could be made of capital amounting to £7,000. There are very many alternative uses of farming resources—land, labour or capital—each of which may produce a profit, but the science of management is to direct them to those uses which yield the highest profits.

But if Mr. Russell's business logic is sometimes faulty, he is greatly to be commended for his candour in disclosing the financial results of his farming activities. All too often management is discussed in generalities, but here figures relating to a specific business are made available and one can discuss and criticize on the basis of concrete facts rather than hypotheses.

In any discussion of farming in the future it is inevitable nowadays that the problems of agricultural marketing should loom large. Mr. Russell's final chapter on this subject is no exception. Organized marketing, whether by marketing boards, groups of farmers or by private contracts, is extolled. There is little that is new in this view of the future which is seen entirely from the farmers' standpoint. Occasionally it might be desirable to recognize more fully that many others, especially the nebulous body of taxpayers and consumers, also have a deep and lasting interest in the future of farming.

H.T.W.

Portrait of Devon. D. ST. LEGER GORDON. Robert Hale. 18*s*.

The artist decides on the mood and expression of the subject he has to portray. In this concise and well-written work on our largest administrative county Mr. Gordon has used a broad canvas. As one would expect, Dartmoor is the main centre of rural interest, with Exeter and Plymouth as focal points of urban activity.

No pen picture of Devon would be complete without some mention of its historical background. Sufficient information about the past has been included to whet the appetite for more information about the present.

Agriculture is one of the most important industries of the present, but its place in the county's economy is challenged with equal

strength by the tourist industry; yet neither has been described as vividly as one would expect. More attention could have been given to the coastal areas and to tourist centres away from Dartmoor, and especially those frequented by fishermen—for sport or for commerce. They are an integral part of Devon, yet receive only a passing reference.

To the agriculturist, some of the comments on modern farmers and farming will appear irksome and uninformed. The broad acres of the South Hams, the Exe Valley and East Devon have not been given the agricultural priority which they deserve. Likewise the farming skills and craftsmanship, still much in evidence in the county, have been overlooked and, therefore, one of the county's largest industries could well feel aggrieved. On the other hand, the author's ability to depict the countryside and all things animal, vegetable and mineral is highlighted by his true-to-life descriptive phrases. The experts may overlook his contention that the 'South Devon sheep is easily recognizable', but will they forgive his omission of the Dartmoor breeds, his 'hand' of 4½ inches and his failure to appreciate the work of local shepherds and their dogs?

There are delightful sections dealing with personalities, places and progress. And, as always in his writings, the section on natural history reveals Mr. Gordon's deep interest, even though the roe deer has 'set timid foot westwards beyond the Otter' for at least a decade.

Above all, the judicious use of local language will give pleasure to readers, Devonian or otherwise. Mention of 'white works', 'vags' and 'fitchies' will bring nostalgic memories to exiles and natives alike.

This portrait of Devon will be welcomed over a wide field and should be added to the bookshelves of those who love the West Country.

P.H.

Farm Power. Young Farmers' Club Booklet No. 33. H. J. HINE. Evans Bros. 3*s*.

This booklet is written for the young reader. The 48 photographs and diagrams are on the whole good and have obviously been chosen with care to stimulate interest in the subject. In most cases the illustration is accompanied by a detailed description of the salient features, and in fact over half the space is utilized in this way.

Farm Power has been divided into four sections. The first explains the basic principles of energy, work and power. The second, on internal combustion engines, describes the four-stroke cycle and the principle components of the spark-ignition and compression-ignition engines. The wide variety of applications of the internal combustion engine on the farm and methods of power transmission are dealt with pictorially. The third section, entitled 'Electrical Power', describes the production of A.C. and D.C. current, its transmission and utilization. Useful laws on electricity are stated and a worked example is given.

The lesser used forms of farm power—steam, wind and water—are included in the fourth and last section. It is a pity that so much space has been allocated to these relatively unimportant forms of power when some new ideas, e.g., hydrostatic transmission, receive only brief mention in other sections.

A useful bibliography is included.

In any process of simplification, as is necessary here for the Young Farmers' Club Series, some loss of precision is inevitable and acceptable, but there are a few instances in this publication where precision has been sacrificed unnecessarily.

G.P.S.

Farmer and Stockbreeder Year Book and Desk Diary, 1964. *Farmer and Stockbreeder* Publications Ltd., Dorset House, Stamford Street, London, S.E.1. 25*s*. (27*s*. by post).

It seems to me that the *Farmer and Stockbreeder* will not be happy until every farmer has a copy of their Year Book and Desk Diary—and in all truth this is not a bad idea. Its ample dimensions (11½ × 8½ in.), one week to a double page, offer both scope and inducement to twentieth century farm diarists to plan and record the thousand and one things which make up the farming year.

The wide-ranging and well-indexed reference section of over 100 pages has been clearly designed to be of real practical help, and its compilation must have kept some editorial staff gainfully employed for a very long time.

The photogravure inset of 1963's top cattle, sheep and pigs will rejoice the heart of every livestock farmer and stockman. And, as he looks across the misty fields this January morning, he may see the up-and-coming champions of tomorrow. Certainly this Year Book is an incentive.

E.D.

The Dairy Farmer's Veterinary Book (4th Edition). NORMAN BARRON. Farming Press. 30*s*.

The financial loss due, directly or indirectly, to disease and ill-health among livestock continues to run into several millions of pounds every year. As one after another of the more dangerous and spectacular diseases are brought under control, our present-day problems of ill-health reveal themselves to be increasingly associated with livestock management, with new methods of farming adding to the difficulties.

Because of the changing situation, Dr. Barron, in this latest edition of his widely-read book, has deemed it necessary completely to review much of his earlier advice and to revise it to conform to modern views. So rapidly do things change, however, that it is not always possible to keep pace with events. For instance, the anthelmintic, phenothiazine, which he widely advises in the treatment and control of bowel-worm infestations, is now surpassed by others even more efficient.

Dr. Barron deals very adequately and clearly with the necessary points in management, from the birth of the calf and throughout its life, which serve not only to prevent the onset of certain forms of ill-health and considerably minimize the effects of others, but also to lay the foundations which will secure maximum production. This might otherwise be prevented by various forms of insidious disease. The need for the early recognition of ill-health by its various manifestations is stressed and advice is offered on the preliminary remedial measures which should be adopted. Nevertheless, there is the frequent exhortation to call in the veterinary surgeon as soon as possible when it is thought to be necessary.

This seems an excellent book, full of useful advice based on long and varied professional experience in many fields; it should be in the possession of all dairy farmers. *W.T.R.*

Industry and the Countryside. H. E. BRACEY. Faber and Faber. 36*s*.

No systematic study of the impact of industry on the countryside has been issued since the Scott Report of 1942. During the past twenty years our rural areas have faced more industry, greater mobility of population and an influx of newcomers. How has it withstood these changes now occurring with great rapidity?

No single volume could ever adequately cover such an enormous field, so Dr. Bracey, in this preliminary inquiry for the Royal Society of Arts, confined his study to three major industries—electricity, oil and the atomic energy establishments.

The nationalized Central Electricity Generating Board came through the investigation fairly well. It is amenity conscious. But the criticism is made that the Board should try to secure greater co-operation, at an early date, from local people. Provided more organizations were informed more fully, much bitterness might be avoided. Transmission of electricity involves poles, pylons and overhead cables. Many low tension cables could be run underground, as is now the case in the historic village of Avebury in Wiltshire.

Oil refining on a large scale in Britain is a relatively new industrial process. The two centres studied were Fawley (Hampshire) and Milford Haven (Pembrokeshire), the same oil company being involved in both places. During the ten-year interval between 1948 (Fawley) and 1958 (Milford Haven) the company's approach to protecting amenities improved greatly.

Perhaps the most public relations minded and amenity conscious was the Atomic Energy Authority at Harwell, Windscale, Dounreay and Winfrith.

But apart from the strict amenity angle, the three groups studied had important local repercussions in other directions—effect on employment, the services, housing, education, transport, and various social organizations. Each is discussed in some detail.

In his conclusion, Dr. Bracey admits that nineteenth century industrial eyesores like coal tips, slag heaps, slums and grime would not be tolerated nowadays. Industrialists are more enlightened; the general public is more alert to the dangers; there is greater Government control. He points out, however, that remoteness is no longer the safety barrier it once was; the countryside no longer belongs to the countryman in the Motor Age. The big new factor of the last twenty years has been the speed of change.

The need for consultations at all levels remains vital, for despite National Parks, planning authorities, Nature Conservancy and the like, 'exceptions in the national interest' will inevitably be put forward in the future.

Exhortations 'to preserve our national heritage' and other catchphrases are no longer adequate. What is needed are facts collected from many industries from all parts of Britain. It is to be hoped that this book will be the forerunner of other equally specific studies. *H.E.*

Turkey Farming. (2nd edition). RAY FELTWELL. Faber and Faber. 50*s*.

The publishers tell us that Mr. Feltwell's book has been brought up to date to meet modern needs. This is basically true, but points have been omitted that would have helped to support the statement. The photographs in the main are disappointing. They give a far from clear depiction of modern production methods and, in fact, appear generally outmoded.

The author states that there is a swing towards windowless houses for rearing. I am inclined to disagree with this, but in any case some mention should surely have been made of the dangers of the respiratory diseases that are associated with such a system. This brings us to the recommendation of extraction rates. It is suggested that ¾–1¼ c.f.m. per lb of body weight is sufficient, but knowing the susceptibility of turkeys to respiratory conditions I should have thought it advisable to provide the maximum of 2 c.f.m.

The chapter on nutrition is probably the most lucid in the book and very much up to date, for Mr. Feltwell is an adviser in this particular field and obviously an authority. I cannot agree, however, with his statement that mixing of rations on the farm 'will rarely if ever either be practical or economic'. This is far too biased, and although later he says that it is impossible to generalize as there are variations, etc., from farm to farm, this explanation does little to palliate such a dogmatic statement.

The points on breeding techniques show very clearly the change that has taken place in the industry since the first edition was written. The approach now suggested is quite different, but even so it is surprising that no reference is made to breeding in folds, as this system is still widely practised.

The information on the use of artificial light to retard, then stimulate sexual maturity is sound and to the point, but although it is specified that the recommendations are in the light of present knowledge, nothing has been said of increasing day length abruptly, as opposed to a gradual process. I think this should be mentioned, as some Americans write of work which clearly shows advantages.

There is some general confusion in the important chapter on diseases, and it is one where the utmost clarity is desirable. It is obvious that the author is on somewhat shaky ground, and in my opinion he would have been wiser to concentrate on giving a sounder background to the various diseases, mode of spread, causation, management points, etc., rather than devoting so much space to treatment. The choice of drugs varies so quickly that there seems little point in specifying so many, and information on treatment can easily be obtained when they are purchased. Reference to this chapter would have been easier if, instead of using alphabetical classification, the more usual method of grouping the various diseases according to causation was followed.

The Appendices contain a wealth of detail most valuable to the farmer, but the author would have been well advised to omit or revise pages 314 and 316 as the data is very out of date. There are much more recent figures available.

The question arises: is the book worth placing on one's bookshelf? I would say, yes, most certainly. It is quite comprehensive and gives a good insight into modern methods. It is easy to read, well laid out and, in general, has much to offer the student and specialist. It can also lay claim to being something of a rarity in that, on a subject monopolized by the Americans, the author is an Englishman.

J.M.C.

Recent Plant Breeding Research, Svalöf, 1946-1961. John Wiley and Sons. 75*s*.

This book is a continuation of the 1948 publication entitled *Svalöf 1886-1946*. It carries twenty-three articles, each with a list of references and a bibliography covering the period, intended to provide a comprehensive report of the research work at Svalöf. It is, however, pointed out in the preface that details of much of the work have already been published in various journals, and that consequently the twenty-one technical items comprising the main body of the book are not necessarily presenting new scientific knowledge.

The articles chosen for inclusion deal with a wide range of topics in a number of agricultural crops—red clover, fodder beet, cruciferous oil crops, brassicas, rye, rye-wheat, potatoes and cereals. Some are of a general breeding nature, such as those on the improvement of highly-bred autogamous species, on induced mutations and on artificial polyploids. Others deal with special problems in particular crops: the use of natural selection in the breeding of red clover, resistance to rust and mildew in cereals, field resistance of potatoes to late blight, and self-incompatibility of herbage grasses.

There are, in addition, articles of special topical interest—breeding for nematode resistance, and physiological aspects of

breeding for high yield. At a more specialized level are articles on the chemical aspects relating to quality in wheat and rye as well as cruciferous oil crops.

Obviously, with such a wide range of content, the book must attract the attention of a large circle of readers. Nevertheless, it is essentially one for plant breeders specialized in particular fields of research and concerned with the improvement of individual crops. Each of the articles is informative and of considerable interest, whether expressing ideas or giving factual information.

Like all the publications from Svalöf, the book is well produced, with some excellent colour plates as well as black and white; the text is also supported by several tables and graphs. The Editorial Committee responsible for this publication can feel well satisfied in having produced a really valuable contribution to plant breeding literature.

G.D.H.B.

Soil Fungi and Soil Fertility. S. D. GARRETT. Pergamon Press. Paperback edition 10*s*. 6*d*.

The author and publishers have here attempted, most successfully, to produce a high-quality, low-priced text-book intended for university students taking courses in biology.

The book is written as an introduction to the science of soil microbiology through the study of soil fungi, so that it is also an introduction to the subject of mycology. By assuming a minimum of biological knowledge, the author has produced a work which should be intelligible to the general public, suitable for 'A' level students, and in addition should appeal to many experienced biologists.

The carefully chosen subject matter and the clear, authoritative style in which it is written make the book extremely easy to read. Interest is sustained by the coherent theme of fungi as members of the microbial community in the soil, some species maintaining soil fertility as universal agents of decay, others having an adverse effect as root parasites.

Beginning with an account of the structure and function of the main groups of microbial soil inhabitants, Dr. Garrett subsequently confines himself to the fungi. He describes their physical organization from simple mycelia to the morphogenesis and structure of mycelial strands, rhizomorphs and fruit bodies. There is a brief account of fungal genetics and classification, and a review of 'Methods for Studying Fungi in Soil' in which comments on the virtues and shortcomings of many of the methods will be particularly useful to beginners.

In the rest of the book, which is both stimulating and interesting, the author discusses modern concepts and ideas concerning substrate colonization, saprophytic competition and the evolution of root infecting fungi, including mycorrhizal fungi. He has drawn freely on the work not only of his research associates at Cambridge but of others too, to show readers the nature of some of the problems involved, and how microbiologists have set about solving them by devising special techniques and using considerable skill and imagination in interpreting results.

Students should benefit greatly by reading this book, which is well produced, has an adequate bibliography and an excellent index.

G.A.S.

Feeding of Fur-Bearing Animals. F. C. AITKEN. Tech. Comm. No. 23. Commonwealth Bureau of Animal Nutrition. 20*s*.

Research scientists, practising veterinarians, and breeders of fur-bearing animals, will find this work useful.

The way in which it is arranged makes it more readable than works of reference often tend to be. This is valuable, because information on nutrition and nutritional diseases of animals has to be sought from the ever-growing mass of scientific publications.

Such a work can never be completely up to date in every detail, but it is nevertheless a most valuable and well-arranged summary.

On the nutria, the only animal of those discussed of which I have special knowledge, the author has had recourse to a fair sample of the extensive foreign literature, much of which is now Russian, Polish and Israeli. Considerable efforts have been made in the U.S.S.R. to acclimatize nutrias in the feral state and in what they describe as 'semi-captivity', and this results in a regular output of publications. The only datum quoted by Mrs. Aitken that might be the subject of discussion is the length of the nutria oestrus cycle, upon which there is disagreement among authors, but the matter is in any case not yet clearly settled.

It is perhaps not out of place to point out that feral nutrias in Britain are now the subject of an intensive pest-control

campaign—and although in the United Kingdom their fur appears to have no market value, Mrs. Aitken points out that nutria flesh is considered to be a delicacy!

R.A.D.

The Soils and Land Use of the District around Bangor and Beaumaris. D. F. BALL. H.M. Stationery Office. 35*s*.

Despite the mountainous nature of the area covered by this survey, which includes most of Snowdonia and restricts the amount of land suitable for crop growing, farming enterprises show a good deal of variation. The increased tourist trade has brought changes in the rural economy, and more attention is now given to the production of milk, eggs, vegetables and flowers for immediate use—all commodities suited to production by the smaller farmer. Arable and grassland farming are, however, by no means a negligible part of the economy.

Following an introductory chapter on the climate and the geological history of the 240 sq. miles surveyed, are descriptions of the methods adopted for mapping and classifying the soils. Information also given about the soils includes their distribution, the rocks or parent materials from which they are derived, and their drainage status; each description concludes with a short note about the agricultural use of the soil and its problems.

The chapter on land use includes a historical account of agricultural practices; present conditions in the six regions are reviewed by Mr. G. Edwards, and Mr. W. A. Lindsay-Smith has contributed a section on 11,000 acres of forests and woodlands in the district.

As well as text figures, there are 23 plates illustrating the landscape in which the soils occur and coloured diagrammatic drawings representing some of the soil profiles.

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The British Council Annual Report 1962–63. 2*s*. 6*d*.

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